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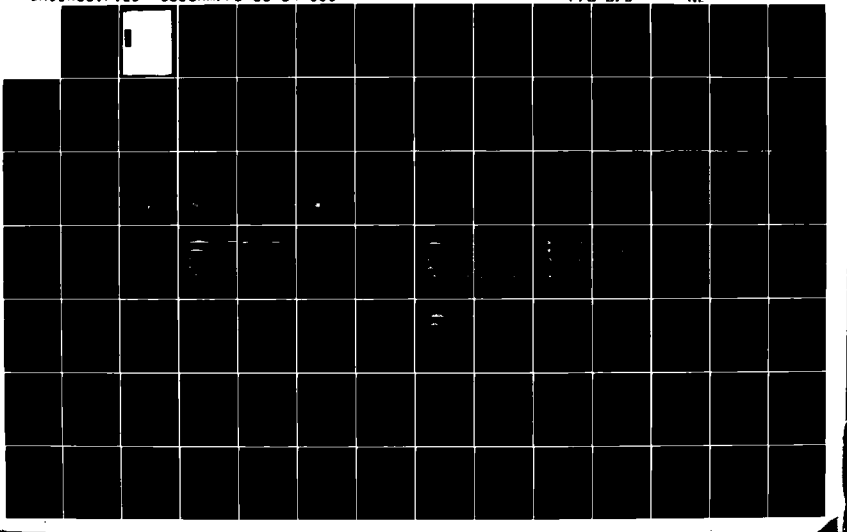

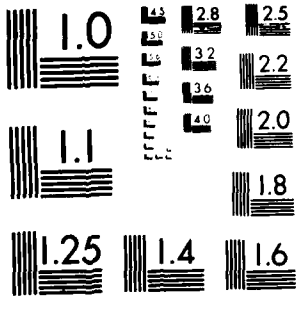

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Generic EIS
Corps of Engineers Permits
Hydrocarbon Permits
Alabama, Mississippi

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

An analysis has been undertaken of the physical biological and socioeconomic effects of hydrocarbon exploration and production activities in coastal Alabama and Mississippi and adjacent Federal waters of the Gulf of Mexico. The analysis consists of two parts: effects and generic unit actions, and cumulative effects of postulated hydrocarbon-related activities in the region over the next 30 years. Four subregions are considered in the analysis: the forested and seasonally-flooded Mobile-Tensaw River Delta, the shallow coastal

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

estuaries of Mobile Bay and Mississippi Sound, and the Alabama and Mississippi state waters of the Gulf of Mexico.

Beneficial effects of hydrocarbon exploration and production activities would include some increase in regional employment and income, the receipt of bonus payments for leases, severance taxes and royalties by the states of Alabama and Mississippi, receipt of lease payments and royalties by private landowners, and an increase in the domestic production of natural gas, sulfur and oil. Other beneficial effects would be the creation of oyster habitat from shell pads placed at drilling locations in Mobile Bay and Mississippi Sound and space for attachment of fouling organisms on drilling/production platforms at all well sites.

The main short-term adverse environmental effects would be turbidity resulting from well site and pipeline construction activities, and the temporary loss of habitat and biological productivity during pipeline construction and during the drilling period at well sites that are eventually abandoned as dry holes.

Long-term adverse environmental effects include the reduction or loss of biological productivity and the alteration of habitat value at producing well sites and along wetland pipeline corridors, which would continue for many years until a well field is abandoned. The operation of drilling rigs, offshore production facilities, and onshore gas and oil cleaning and processing facilities would contribute to regional air pollutant emissions until the regional hydrocarbon resource is depleted. Loss of well control or rupture of a pipeline releasing oil could have an extensive effect on regional ecosystems and economies, depending on the size of the spill. Loss of well control or rupture of a pipeline releasing natural gas containing hydrogen sulfide could endanger human health and be harmful to plants and animals near the point of release.

EXECUTIVE SUMMARY

EXPLORATION AND PRODUCTION OF HYDROCARBON RESOURCES IN COASTAL ALABAMA AND MISSISSIPPI

FINAL GENERIC ENVIRONMENTAL IMPACT STATEMENT

LEAD AGENCY:

U.S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT

COOPERATING AGENCIES:

U.S. ENVIRONMENTAL PROTECTION AGENCY
U.S. FISH AND WILDLIFE SERVICE
NATIONAL MARINE FISHERIES SERVICE
ALABAMA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
ALABAMA OIL AND GAS BOARD
MISSISSIPPI DEPARTMENT OF NATURAL RESOURCES
MISSISSIPPI DEPARTMENT OF WILDLIFE CONSERVATION, BUREAU OF MARINE RESOURCES
MISSISSIPPI OIL AND GAS BOARD

NOVEMBER 1984

FINAL
GENERIC ENVIRONMENTAL IMPACT STATEMENT

EXPLORATION AND PRODUCTION OF HYDROCARBON RESOURCES IN COASTAL ALABAMA AND MISSISSIPPI

The responsible lead agency is the U.S. Army Corps of Engineers, Mobile District, which has jurisdiction over permit applications for oil and gas activities in navigable waters and adjacent wetlands under the authority of Section 10 of the River and Harbor Act of 1899 and Section 404 of the Federal Water Pollution Control Act of 1972, as amended by the Clean Water Act of 1977.

Cooperating federal and state agencies include the U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, U.S. Geological Survey, National Marine Fisheries Service, Alabama Department of Environmental Management, Alabama Oil and Gas Board, Mississippi Department of Natural Resources, Mississippi Department of Wildlife Conservation, and Mississippi Oil and Gas Board.

Abstract: An analysis has been undertaken of the physical biological and socioeconomic effects of hydrocarbon exploration and production activities in coastal Alabama and Mississippi and adjacent federal waters of the Gulf of Mexico. The analysis consists of two parts: effects of generic unit actions, and cumulative effects of postulated hydrocarbon-related activities in the region over the next 30 years. Four subregions are considered in the analysis: the forested and seasonally-flooded Mobile-Tensaw River Delta, the shallow coastal estuaries of Mobile Bay and Mississippi Sound, and the Alabama and Mississippi state waters of the Gulf of Mexico.

Beneficial effects of hydrocarbon exploration and production activities would include some increase in regional employment and income, the receipt of bonus payments for leases, severance taxes and royalties by the states of Alabama and Mississippi, receipt of lease payments and royalties by private landowners, and an increase in the domestic production of natural gas, sulfur and oil. Other beneficial effects would be the creation of oyster habitat from shell pads placed at drilling locations in Mobile Bay and Mississippi Sound and space for attachment of fouling organisms on drilling/production platforms at all well sites.

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Additional information on this Final Generic Environmental Impact Statement may be obtained from:

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U.S. Army Corps of Engineers
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Mobile, Alabama 36628
Commercial (205) 690-2658
FTS 537-2658

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

1.1 This volume provides an overview of the Final Generic Environmental Impact Statement (GEIS): Exploration and Production of Hydrocarbon Resources in Coastal Alabama and Mississippi. A brief background description of the area affected and hydrocarbon activities that have and could occur is presented first in this document. Then the authority under which the EIS is prepared is summarized along with the intent, purpose and need for this statement. Figures depicting selected aspects of the existing environment of the region follow the background material. Feasible alternative methods, equipment and support systems that could be used to develop the hydrocarbon resources in the Mobile Delta, Mobile Bay, Mississippi Sound, state waters of the Gulf of Mexico and adjacent uplands are then tabulated in the form of unit actions. Summary tables of generic environmental loadings and effects for each of the unit actions within the four operating environments of the region are then given.

1.2 Regional resource development scenarios were developed during the course of the EIS process. High, medium and low estimates of the potential total recoverable hydrocarbons have been made for the area along with assumptions on the timing and intensity of resource production over the next 30 years.

1.3 The development scenarios coupled with the unit actions have been used to determine the potential cumulative environmental effects that could result in the region over time. Summary tables of the potential effects described in the GEIS follow the unit action material. Mitigating measures are proposed in Chapter 10 of the GEIS to alleviate potential adverse consequences; these proposals are summarized following summary tables of the potential cumulative effects of hydrocarbon activity. Finally, a reproduction of the GEIS Chapter 13 "Interagency Perspective and Recommendations" is given. The chapter represents a cooperative effort on the part of all participating federal and state agencies to evaluate the potential impacts and plan for them in advance.

CHAPTER 2

BACKGROUND, AUTHORITY AND THE INTENT, PURPOSE AND NEED FOR THE GENERIC ENVIRONMENTAL IMPACT STATEMENT

Over the past several years, considerable interest has developed over the potential for the recovery of commercial quantities of oil and natural gas from geological formations beneath the coastal waters of Alabama and Mississippi. Leasing has taken place in both state waters and the contiguous federal waters of the Gulf of Mexico, mostly in Alabama waters and vicinity. The potential for oil and gas formations underlying the Mobile River Delta in Mobile County, Alabama has also resulted in interest in exploration of this wetland area.

2.2 Because of the expected resource development activities that may occur in the region, the Mobile District of the U.S. Army Corps of Engineers, and the U.S. Environmental Protection Agency have prepared this document with assistance from consultants. Other cooperating agencies (Table 2-1) have contributed information as needed during the preparation of the document through review and comment on the preliminary draft. This Generic Environmental Impact Statement has been prepared to evaluate the environmental issues associated with the anticipated hydrocarbon exploration and production from the lands underlying the Mobile Delta, Mobile Bay, Mississippi Sound and adjacent state waters of the Gulf of Mexico. The location of these areas are shown in Figure 2-1. The study region encompasses these areas in addition to the counties of Southern Alabama and Mississippi.

HISTORY OF OIL AND GAS RELATED ACTIVITIES IN THE STUDY AREA

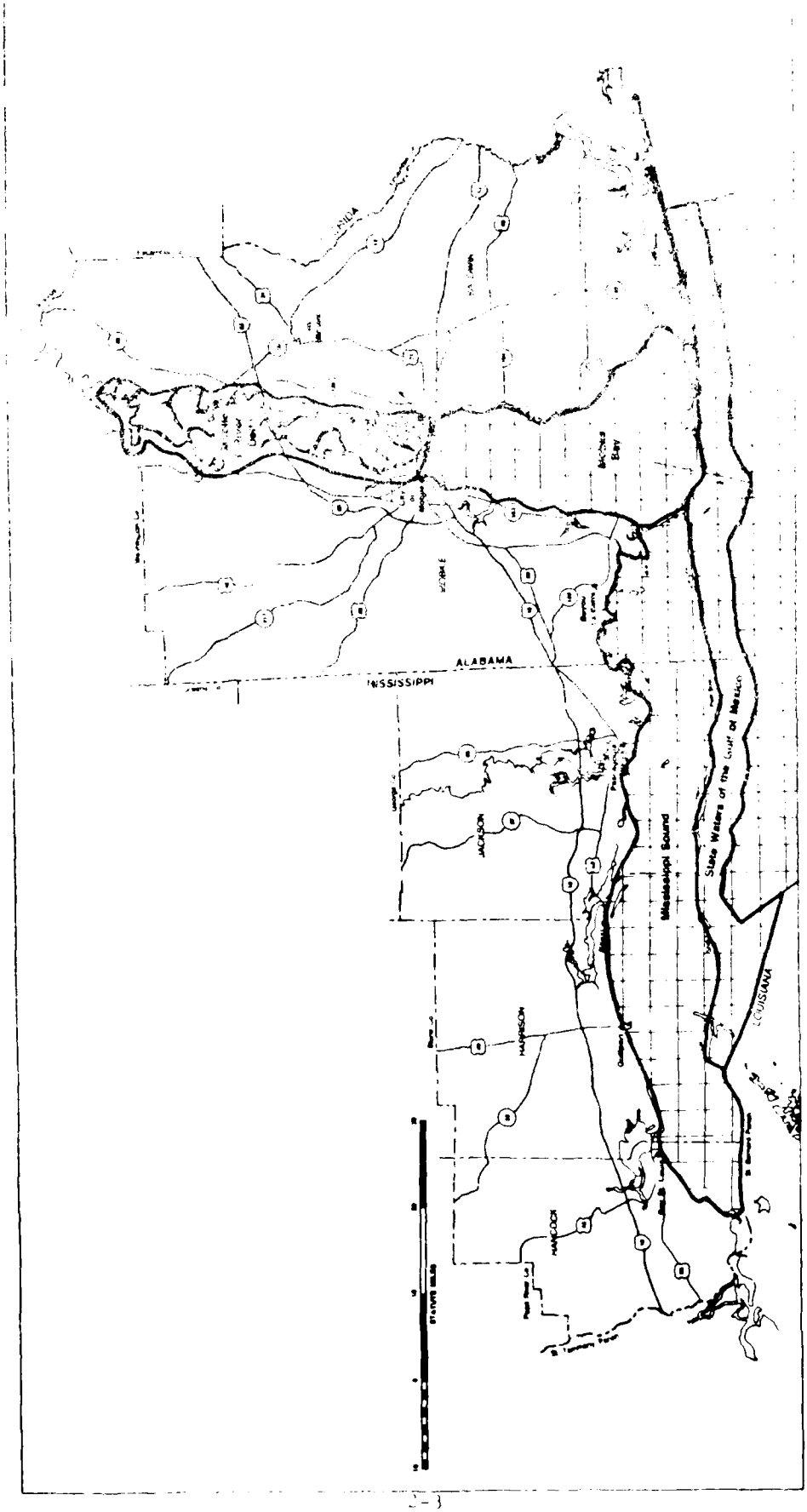
2.3 Exploratory and production drilling has occurred around the study area since 1950 in Alabama and 1955 in Mississippi, with many fields producing commercial quantities of oil and gas (Figure 2-2). Recently, several fields were established in southern Baldwin County and are producing gas from relatively shallow formations. Although no fields are yet established in southern Mobile County, several wells have been drilled successfully to these same shallow formations, and exploratory drilling continues.

2.4 Within the wetland and coastal waters under consideration in the study (Figure 2-_), drilling has occurred in the Mobile Delta and in Mobile Bay. In the Delta region, early production centered on moderate depth formations on the northern and eastern edges of the Delta (the South Carlton and Tensaw Lake fields). Within the Delta, four exploratory efforts between 1963 and 1979 resulted in dry holes. In 1982, oil and gas were discovered in a deep formation in the Delta east of Mount Vernon

TABLE 2-1

FEDERAL AND STATE AGENCIES COOPERATING IN THE PREPARATION OF THE GENERIC ENVIRONMENTAL IMPACT STATEMENT

U.S. Army Corps of Engineers
U.S. Environmental Protection Agency, Region IV
U.S. Fish and Wildlife Service
U.S. Geological Survey
National Marine Fisheries Service
Alabama Department of Environmental Management
Alabama Oil and Gas Board
Mississippi Department of Natural Resources
Mississippi Department of Wildlife Conservation
Mississippi Oil and Gas Board


ALABAMA
MISSISSIPPI
Mississippi Sound
State Waters of the Gulf of Mexico
LOUISIANA
JACKSON
HARRISON
HANCOCK
Statute Miles

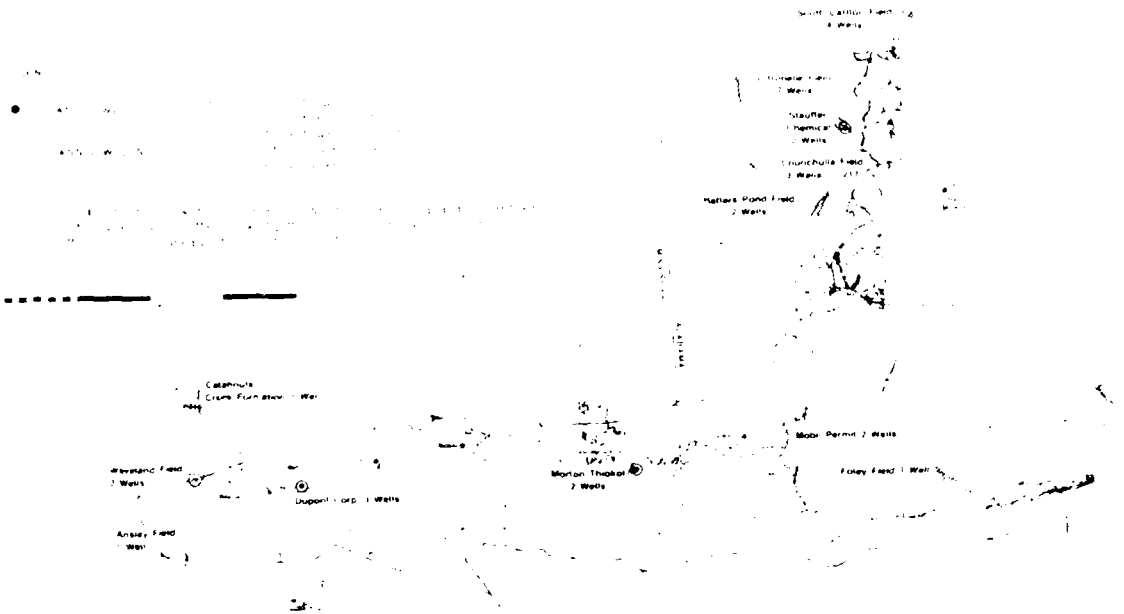


FIGURE 3-6
LOCATION OF CLASS I AND CLASS II DISPOSAL WELLS

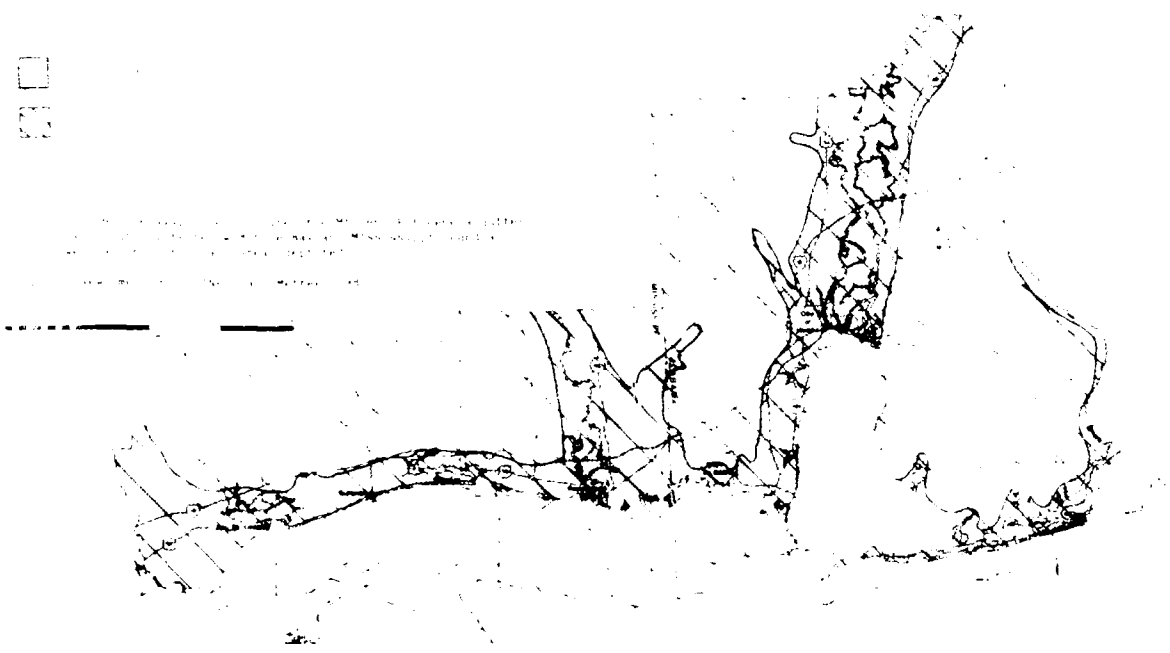
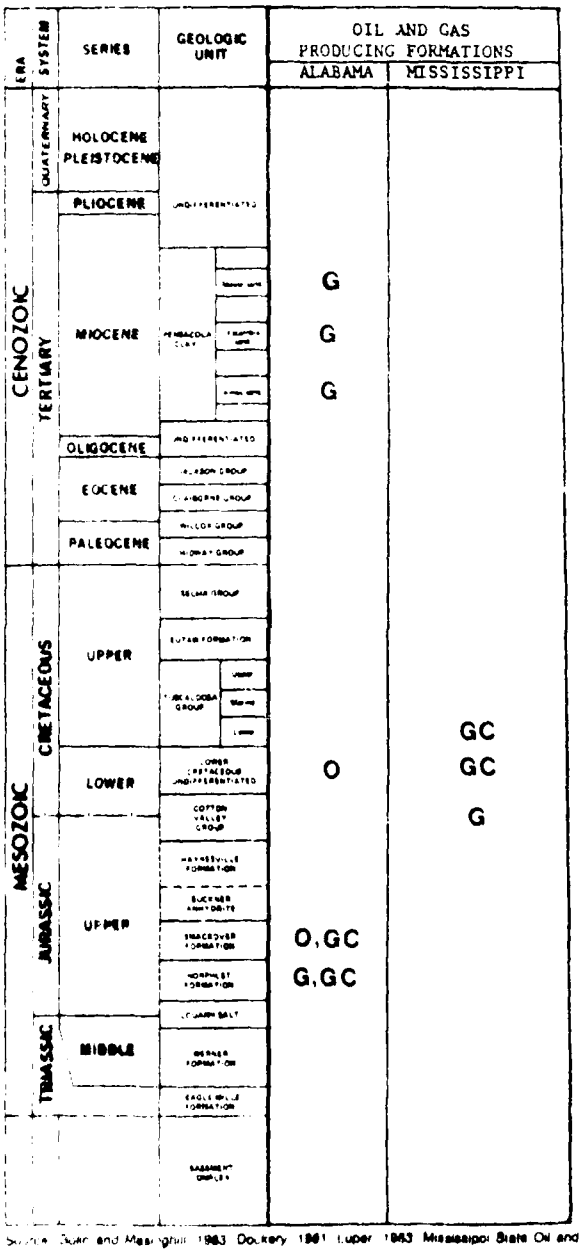


FIGURE 3-5
AQUIFERS OF COASTAL ALABAMA AND MISSISSIPPI



O- Oil
G- Gas
GC- Gas-Condensate

Source: Scott and Meisinghill 1983 Dockery 1981 Luper 1983 Mississippi State Oil and Gas Board 1983

FIGURE 3-4
GENERALIZED STRATIGRAPHIC COLUMN OF OIL AND GAS PRODUCING AREAS OF COASTAL ALABAMA AND MISSISSIPPI

through 2-21 at the end of this chapter. For the cumulative analyses, separate computations were given for geophysical exploration, drilling, production, abandonment activities, loss of well control and accidents. These activities were considered for the Mobile Delta (Tables 2-2 through 2-6), Mobile Bay and Mississippi Sound (Tables 2-7 through 2-11), state waters of the Gulf of Mexico (Tables 2-12 through 2-16), and for associated activities occurring on upland areas adjacent to the study region (Tables 2-17 through 2-19). The cumulative environmental effects associated with the resource development scenarios are summarized in Tables 2-20 and 2-21.

3.19 Impacts on surface water resources, in terms of the development activity not violating regulatory standards, are not clearly quantifiable. Even with individual permit applications, the impacts on hydrology and water quality would vary based on storm events and flows of water from upstream areas. Hence, the assessment of impacts on water resources and other portions of the environment is as quantitative as possible recognizing that uncertainties are evident.

Assumptions on Which All Analyses Are Based

3.7 The following are assumptions on which all analyses have been based:

- o No discharge will be allowed of drilling fluids, cuttings, formation waters, contaminated wastewaters or contaminated rainwater runoff into waters of the study region.
- o Discharge will be allowed of uncontaminated rainwater, uncontaminated washwater, uncontaminated fire pump test water and non-contact cooling water to waters of the study region.
- o All canals and slips for use of an inland drilling barge will be restored to preproject contours upon abandonment.
- o All dredged access channels to well sites will be backfilled upon abandonment.
- o All pipeline trenches will be backfilled to preproject contours.
- o All current local, state and federal regulations will be followed.
- o The number of surface structures in wetland and aquatic areas will be minimized, and some joint ventures will be used for pipelines.

The first 5 assumptions are current policy of state agencies and the Mobile District. Should these policies change in the future, the Generic Environmental Impact Statement may be supplemented and the findings and conclusions changed if necessary.

COMPARISON OF ENVIRONMENTAL CONSEQUENCES OF ALTERNATIVES

3.8 The environmental loadings and generic environmental effects of unit actions in the Mobile Delta, Mobile Bay, Mississippi Sound, state waters of the Gulf of Mexico and upland areas adjacent to the study region are discussed in Chapters 4 through 7 of the GEIS. The environmental effects of the three postulated resource development scenarios are discussed in Chapter 8 of the GEIS. Comparisons of the effects associated with the alternatives considered are given in Chapter 2 of the GEIS and in Tables 2-2

TABLE 3-1

UNIT ACTIONS CONSIDERED IN CHAPTERS 4 THROUGH 7 OF THE GEIS

Mobile Delta	Mobile Bay And Mississippi Sound	State Waters Of The Gulf Of Mexico	Activities Occurring On Uplands
GEOPHYSICAL EXPLORATION PHASE			
Swamp buggies Surveys from Uplands	Seismic survey boats Marsh buggies in salt marshes	Seismic survey boats	Surveys from uplands
DRILLING PHASE			
Inland drilling barge Canal and slip River bank slip River channel location Fixed drilling platform Canal access Trestle road access River bank location Board road and ring levee Directional drilling from uplands	Inland drilling barge Jackup drilling rig Submersible drilling rig Fixed drilling platform Directional drilling from uplands	Jackup drilling rig Submersible drilling rig Fixed drilling platform Directional drilling from uplands	Upland well site
PRODUCTION PHASE			
Well completion Gathering system construction Normal operations of wells and pipelines Well workover Enhanced recovery	Well completion Platform installation Gathering system construction Normal operations of wells and pipelines Well workover Enhanced recovery	Well completion Production platform installation Gathering system construction Normal operations of wells and pipelines Well workover Enhanced recovery	Well completion Gathering system construction Treatment facility construction Normal operations of gathering system Normal operations of treatment facilities Well workover Enhanced recovery Transport of resource to intermediate market Services bases
ABANDONMENT PHASE			
Well site Pipelines	Well site Pipelines	Well site Pipelines	Upland well site Pipelines Treatment facilities Service bases

- o The mostly forested and seasonally flooding Mobile Delta.
- o The shallow protected coastal waters of Mobile Bay and Mississippi Sound.
- o The nearshore Gulf of Mexico waters.
- o The adjacent upland areas.

The unit actions considered are given in Table 3-1.

Regional Resource Development Scenarios

3.4 The future environmental effects of oil and gas exploration and production activities in coastal Alabama and Mississippi will be a function of all the activities occurring together in the region at any time. In general, several activities will be occurring concurrently, such as drilling and production, and construction and operation activities. The amount and intensity of activity will be a function of the quantity of hydrocarbon resource that can be recovered, the timing of the leasing of public waters and private lands, lease exploration and development schedules established by the lease holders, and future factors affecting the hydrocarbon market.

3.5 The environmental analysis is based on an estimate of the recoverable hydrocarbon resource in the region, scenarios for development of these resources and the environmental loadings of the unit actions. The resource development scenarios establish upper and lower limits on the level of concurrent activities that could occur in each subregion over the next 30 years, based on certain assumptions about the timing of resource discovery and schedules of resource production. The development scenarios are not predictions of what will happen in the future. They merely establish limits within which future development is likely to occur. The resource development scenarios are given in Figures 8-1 through 8-6 (the figure numbers in the GEIS) at the end of this chapter.

3.6 The concurrent resource development activities by year are used to determine environmental alterations that could result from these activities. Several examples are habitat area disturbed over time, the effect of habitat disturbance on regional ecosystems, labor force required and the socioeconomic effect of these requirements, regional air and water quality, and environmental and safety considerations of accidents.

CHAPTER 3

SUMMARY OF THE EXISTING ENVIRONMENT, COMPARISON OF UNIT ACTION ALTERNATIVES, AND POTENTIAL CUMULATIVE ENVIRONMENTAL EFFECTS

SELECTED ASPECTS OF THE EXISTING ENVIRONMENT

3.1 The study area consists of four ecosystems; the mostly forested floodplain of the Mobile-Tensaw River Delta characterized by seasonal flooding, the shallow river-dominated coastal estuary of Mobile Bay, the higher salinity shallow estuary of Mississippi Sound, and the nearshore coastal environment of the state-controlled-waters of the Gulf of Mexico. To provide an overview of the physical, biological and socioeconomic characteristics of these four areas, selected maps from the Affected Environment Section (Chapter 3) of the GEIS are provided here. The figure numbers and page numbers are those for the figures in the GEIS.

ALTERNATIVES CONSIDERED

3.2 Alternatives considered in the generic environmental impact statement are those feasible methods, equipment and support systems that could be used for hydrocarbon exploration and production in the Mobile Delta, Mobile Bay, Mississippi Sound, State waters of the Gulf of Mexico and adjacent upland areas. These are considered for each region for unit actions of the geophysical exploration, drilling, production and abandonment phases of resource development. Additionally, the cumulative environmental effects of producing three alternative total quantities of hydrocarbons over the next 30 years in the study region have been investigated.

Unit Action Alternatives

3.3 Unit actions based on various alternative methods, equipment and support requirements for the various activities within each hydrocarbon resource development phase have been identified. Four exploration and operating environments have been identified within the study region. A unit action is defined as a group of activities or sequence of events that occur together to complete a particular portion of a phase of hydrocarbon exploration and production. Some examples of unit actions are site preparation for a drilling alternative, well completion, gathering system construction, and gas treatment facility operation. The unit actions are analyzed (Chapters 4 through 7 of the GEIS) for their generic environmental loadings and effects within the study region:

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2.13 During the period of time necessary to complete the generic environmental impact statement process the District will continue to accept and process permit applications for hydrocarbon exploration and production in the study area. Decisions on the applications will be based on the overall public interest review at that time and will not be delayed solely because of the ongoing development of the environmental impact statement.

2.14 Permit applications received by the District will continue to be processed on an individual basis. For each application, as is necessary, a public notice will be issued providing opportunity for the public to request a public hearing or to comment on the proposal; the District will prepare an environmental assessment of the proposal to determine if there are potentially significant environmental impacts that would require the preparation of a site-specific impact statement. The District will also send the proposal to the appropriate agencies for their review.

2.15 If the District Engineer determines that a project for which a permit has been requested has the potential for significant effects upon the quality of the human environment and it is believed that issuance of a permit may be warranted, then an environmental impact statement will be prepared to address that specific permit request. This impact statement may be a part of the ongoing generic environmental impact statement, a supplement to the generic environmental impact statement or a separate impact statement on its own merits. If no significant impacts are suspected, then the site-specific request will continue to be processed based on the results of the environmental assessment.

INDUSTRY PURPOSE AND NEED FOR HYDROCARBON RESOURCE DEVELOPMENT ACTIVITIES

2.10 The oil and gas industry has obtained mineral leases in the study area from the states of Alabama and Mississippi and from private individuals or organizations. In the contiguous federal waters, leases have been obtained from the U.S. government. It is likely that additional leases will be obtained in the future. The lease holders intend to determine if hydrocarbon resources exist on their leased tracts in commercially recoverable quantities. If so, they intend to recover the resource for sale to the public. To do so, the lease holders must erect structures for the drilling of wells and the production of the resource, lay pipelines to transport the resource, construct and operate resource cleaning and handling facilities, operate and maintain facilities for servicing the drilling and production sites and dispose of waste products resulting from these operations. Lease holders must obtain permits for their activities from the Corps of Engineers and other federal, state and local governmental organizations. The information contained in the Generic Environmental Impact Statement will assist the District Engineer in making timely and responsible decisions on permit requests for the exploration and production of hydrocarbon resources in the coastal waters and wetlands of the Mobile District.

PUBLIC PURPOSE AND NEED FOR HYDROCARBON RESOURCE DEVELOPMENT ACTIVITIES

2.11 The quantity of petroleum resources imported to the United States has increased greatly in recent years. This has raised public concern regarding the extent to which the United States is dependent on a foreign resource and has increased awareness of the need to find and utilize domestic sources of hydrocarbons. The recovery of hydrocarbons from the study area will contribute to the domestic store of this resource, enhance the national defense posture of the United States by reducing dependance on foreign sources of hydrocarbons, improve the U.S. balance of trade and provide employment and income to the region.

2.12 The District Engineer must consider the environmental effects of oil and gas activities requiring permits from the Mobile District. These effects are discussed for the public record in the Generic Environmental Impact Statement and public comments are considered in preparing the document. This process assures that the need to develop hydrocarbon resources is considered in the context the need to protect environmental resources.

the "Secretary [of the Army, acting through the Chief of Engineers] may issue permits, after notice and opportunity for public hearing for the discharge of dredged or fill material into the navigable waters at specified disposal sites."

2.7a To obtain permits for activities requiring them, an applicant submits a form to the District office before beginning any work. Applicants furnish a detailed project description including drawings, lists of adjoining property owners and status of approvals or certifications required by other federal and state agencies. Once the application is received, it is acknowledged, processed and a public notice is issued. Normally, there is a 30-day comment period when federal, state and local agencies, individuals and special interest groups may review the application considering various environmental and public interest factors. A public hearing may also be held during the 30-day review period. All comments are then considered by the Corps in evaluating applications. If no serious objections or questions are raised, about 60 days are needed for the process. If the application is approved the applicant signs the document, returning it with a fee, and the permit is issued.

2.8 The Mobile District, Corps of Engineers has three administrative options available to it regarding the disposition of permit applications for structures and activities associated with oil and gas development projects. These are as follows:

- o Grant a permit as requested.
- o Grant a permit with restrictions or conditions.
- o Deny a permit.

INTENT, PURPOSE AND NEED FOR THE GENERIC ENVIRONMENTAL IMPACT STATEMENT

2.9 The District Engineer of the Mobile District, U.S. Army Corps of Engineers has determined that possible future development of hydrocarbon resources in the coastal areas of Alabama and Mississippi could potentially have a significant cumulative effect on the human environment, thereby requiring the preparation of an environmental impact statement under the provisions of the National Environmental Policy Act (NEPA). The intent of the study is to identify and consider the environmental effects that could result if permits are requested for and issued by the District for hydrocarbon resource development projects in the study area. These effects are to be considered in conjunction with resource development activities that could occur in contiguous federal waters. The cumulative effects identified in this document must be considered in deliberations by the District Engineer in future permit applications.

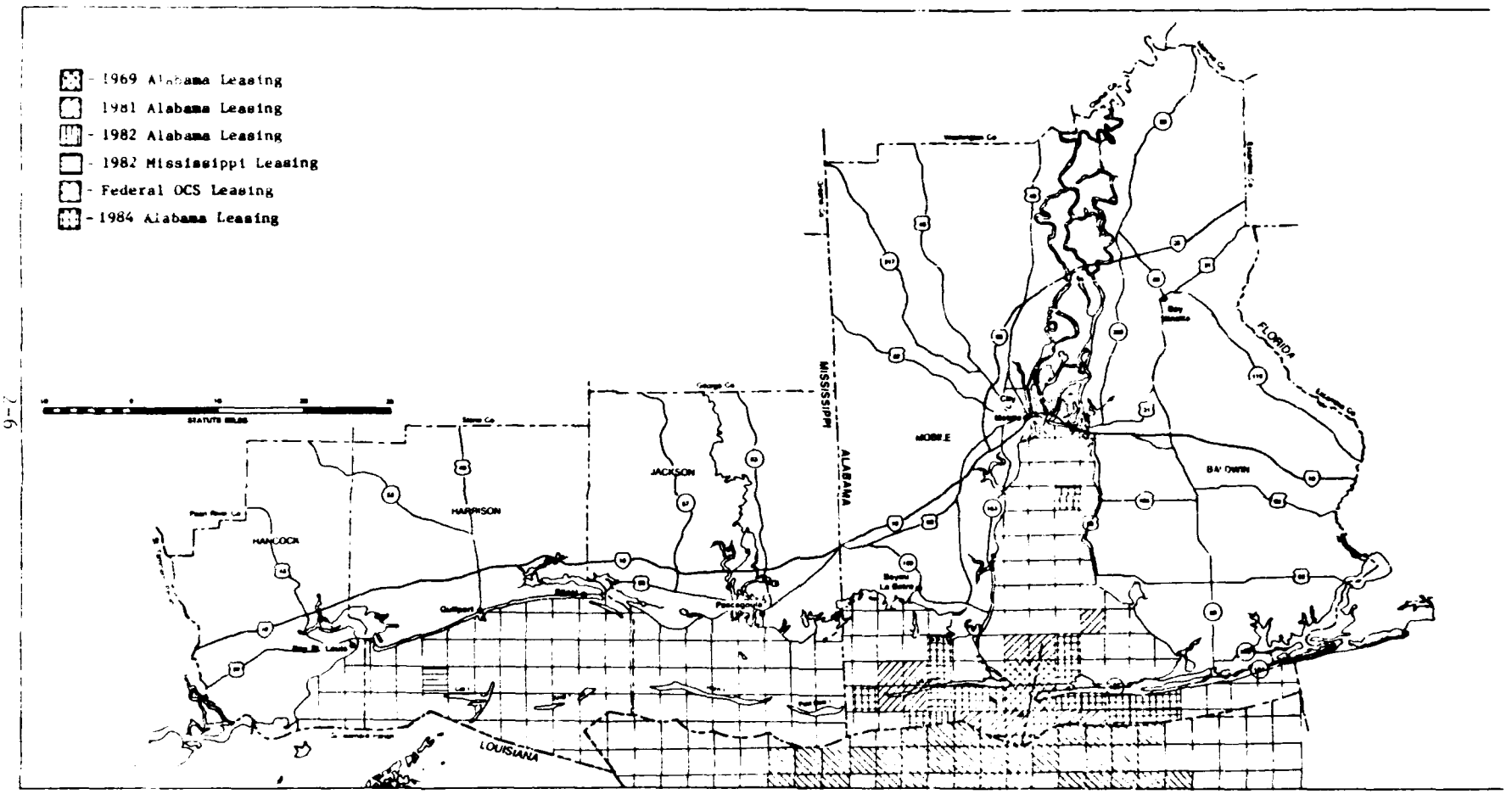


FIGURE 2-3

OIL AND GAS LEASING ACTIVITY

(Mobile County, Alabama) and in early November, 1983, two wells began producing commercial quantities of oil and gas. Within Mobile Bay, two unsuccessful wells were drilled in the mid-bay area in 1951-1952 and no further activity occurred until the 1978-1979 gas discovery in southern Mobile Bay.

2.5 Leasing in state waters of the study area was initiated in 1969 when Mobile Oil Corporation leased four blocks in southern Mobile Bay (Figure 2-3) (Raymond, 1982). Drilling of the first well on these tracts occurred in 1978 and 1979. Subsequently, development wells were drilled, and commercial recovery of natural gas from these tracts is expected to begin by late 1986.

2.6 Since Mobil's discovery, other tracts in the state waters of Alabama and Mississippi and in the contiguous federal waters have been leased. By late 1983, two of these tracts in Alabama waters had been drilled. Tracts leased to date in the study region and vicinity are shown in Figure 2-3.

AUTHORITY OF THE U.S. ARMY CORPS OF ENGINEERS

2.7 The U.S. Army Corps of Engineers must assess the environmental effects of a project for which a permit is being requested before making a decision on denial or approval of the permit. Authority for this is derived from several sources, including the following:

- The River and Harbor Act of 1989.
- The National Environmental Policy Act of 1969.
- The Clean Water Act of 1977.
- Rules and Regulations of the Corps of Engineers, such as:
  - Regulatory Program of the Corps of Engineers (33 CFR 320-330)
  - Environmental Quality: Policy and Procedures for implementing the National Environmental Policy Act (33 CFR 230)

Specifically, Section 10 of the River and Harbor Act of 1899 prohibits the construction of any structure in or over navigable waters of the United States and probibits the excavation from or depositing of materials in such waters, or the accomplishment of any other work affecting the course, location, conditions or capacity of such waters, unless the work has been authorized by the Secretary of the Army. Also, it is stated in Section 404 of the Clean Water Act that

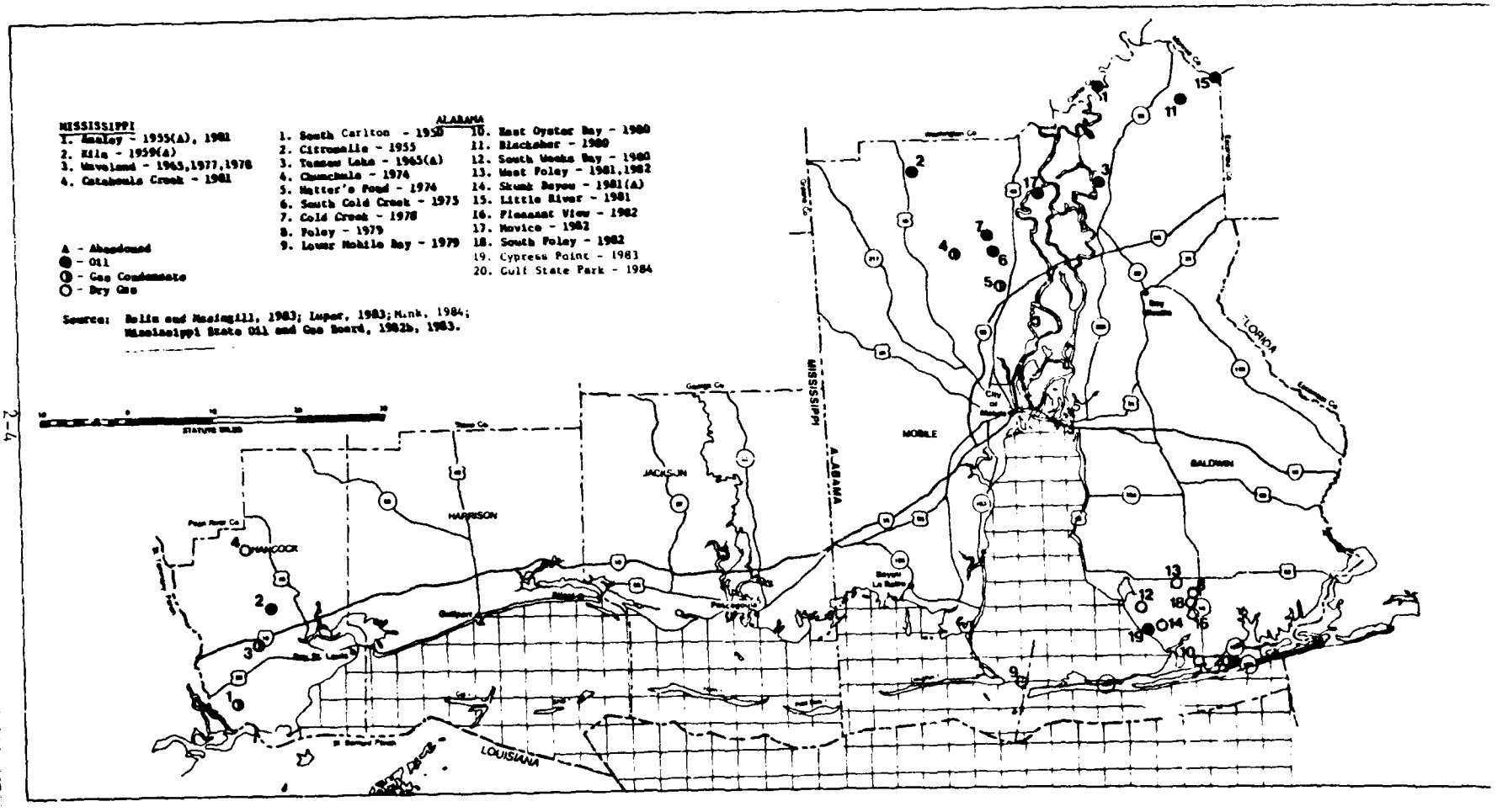


FIGURE 2-2

OIL AND GAS FIELDS

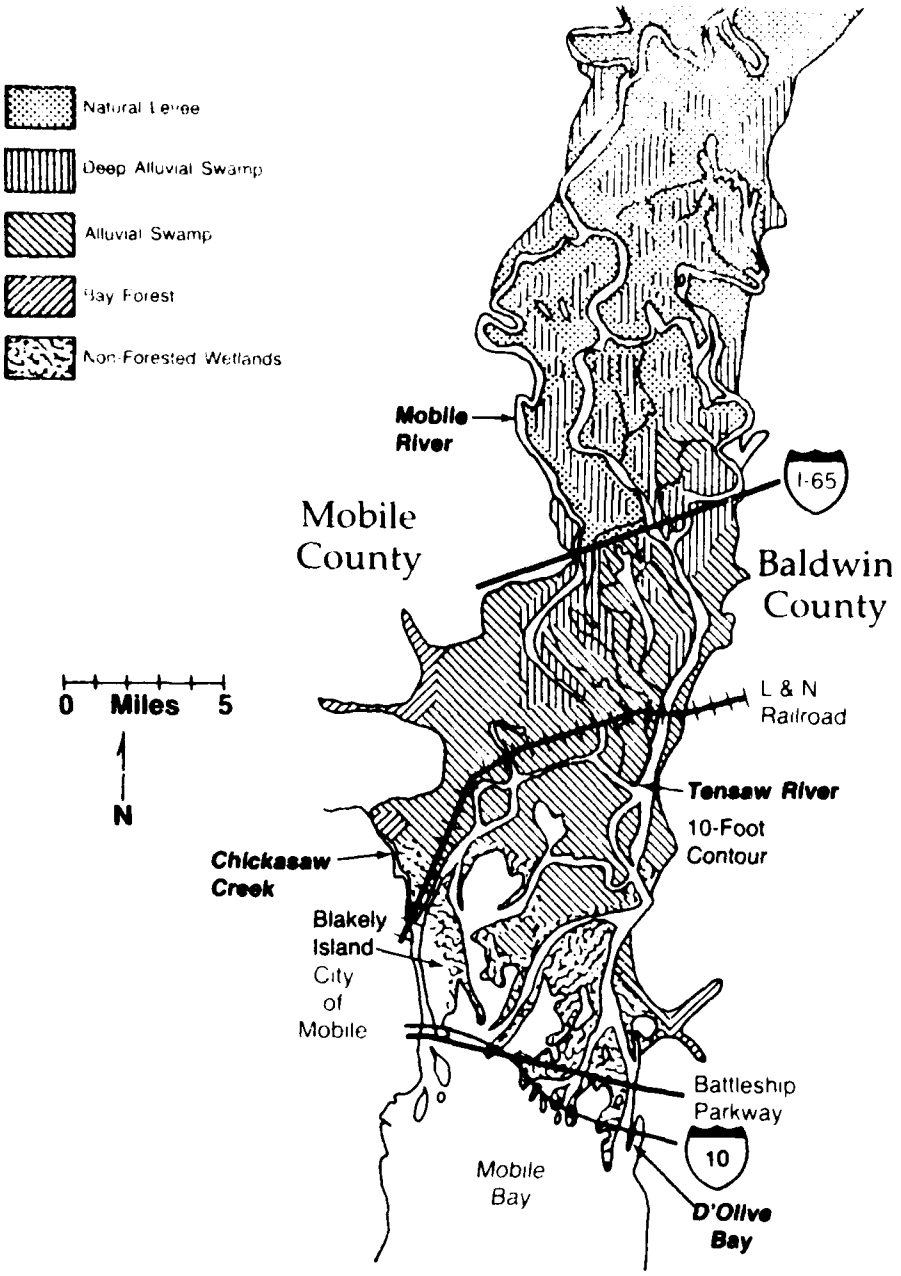
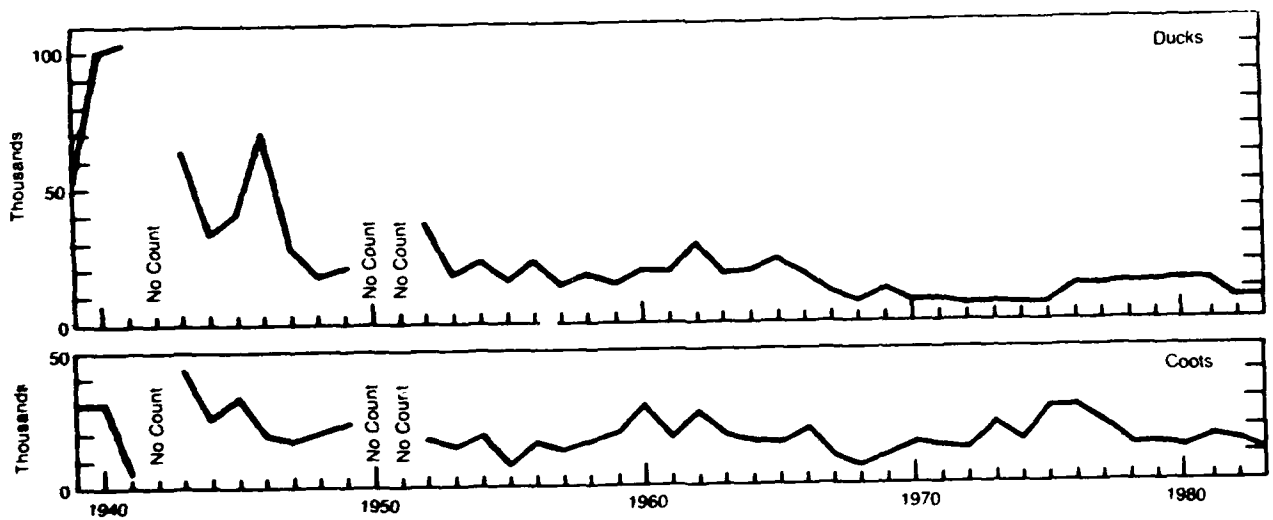
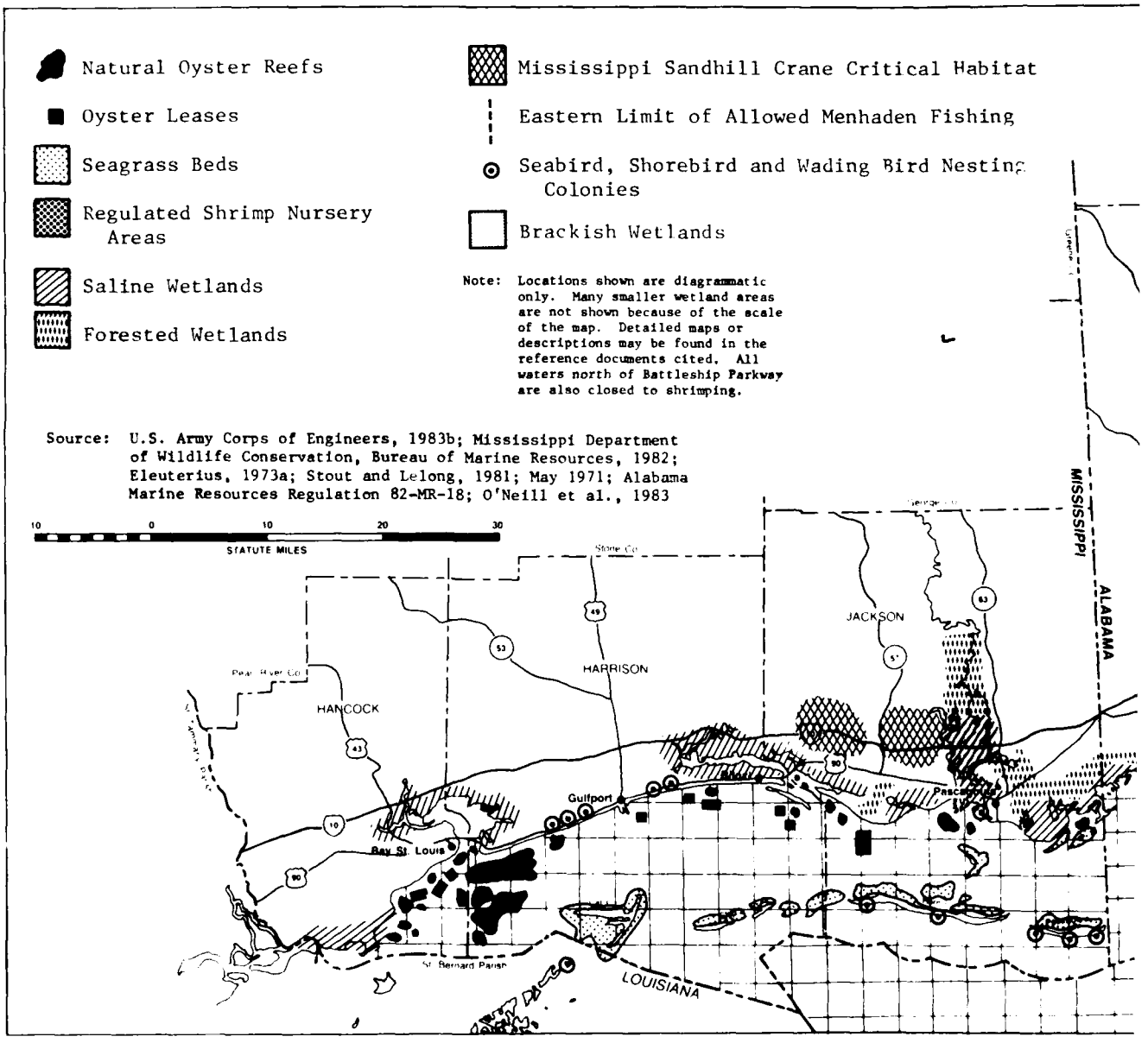


FIGURE 3-9
WETLAND COMMUNITIES IN THE MOBILE DELTA



Source: U.S. Fish and Wildlife Service, Starkville, MS; Beshears, 1979

FIGURE 3-10
JANUARY COUNTS OF WINTERING POPULATIONS
OF DUCKS AND COOTS IN THE MOBILE DELTA


Natural Oyster Reefs
Oyster Leases
Seagrass Beds
Regulated Shrimp Nursery Areas
Saline Wetlands
Forested Wetlands
Mississippi Sandhill Crane Critical Habitat
Eastern Limit of Allowed Menhaden Fishing
Seabird, Shorebird and Wading Bird Nesting Colonies
Brackish Wetlands
Note: Locations shown are diagrammatic only. Many smaller wetland areas are not shown because of the scale of the map. Detailed maps or descriptions may be found in the reference documents cited. All waters north of Battleship Parkway are also closed to shrimping.
Source: U.S. Army Corps of Engineers, 1983b; Mississippi Department of Wildlife Conservation, Bureau of Marine Resources, 1982; Eleuterius, 1973a; Stout and Lelong, 1981; May 1971; Alabama Marine Resources Regulation 82-MR-18; O'Neill et al., 1983
10 0 10 20 30
STATUTE MILES
Stone Co.
Pearl River Co.
HANCOCK
HARRISON
JACKSON
MISSISSIPPI
ALABAMA
Gulfport
Pascagoula
Bay St. Louis
St. Bernard Parish
LOUISIANA

Critical Habitat

enhaden Fishing

ing Bird Nesting

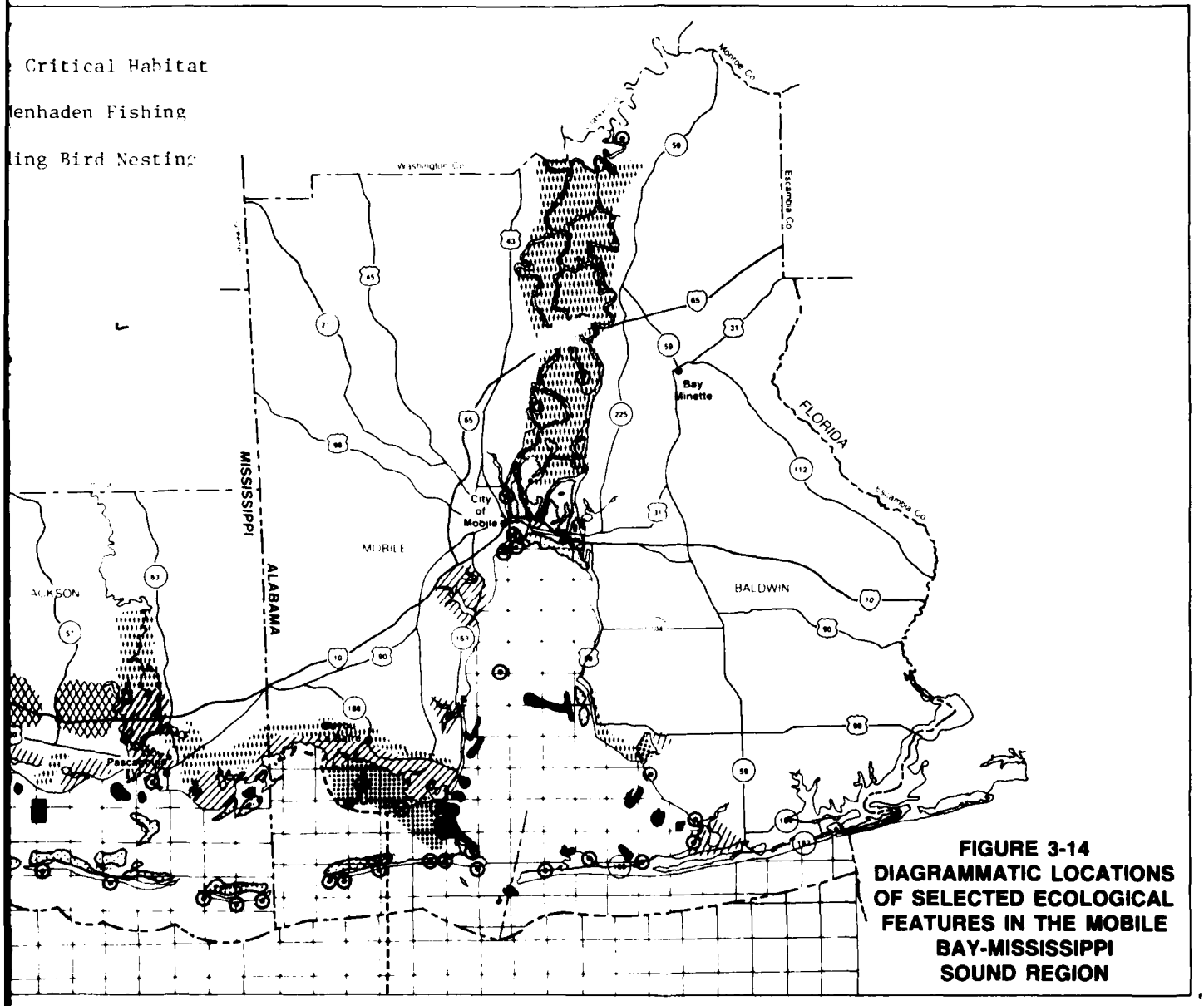


FIGURE 3-14
DIAGRAMMATIC LOCATIONS OF SELECTED ECOLOGICAL FEATURES IN THE MOBILE BAY-MISSISSIPPI SOUND REGION

MISSISSIPPI SOUND AND MOBILE BAY

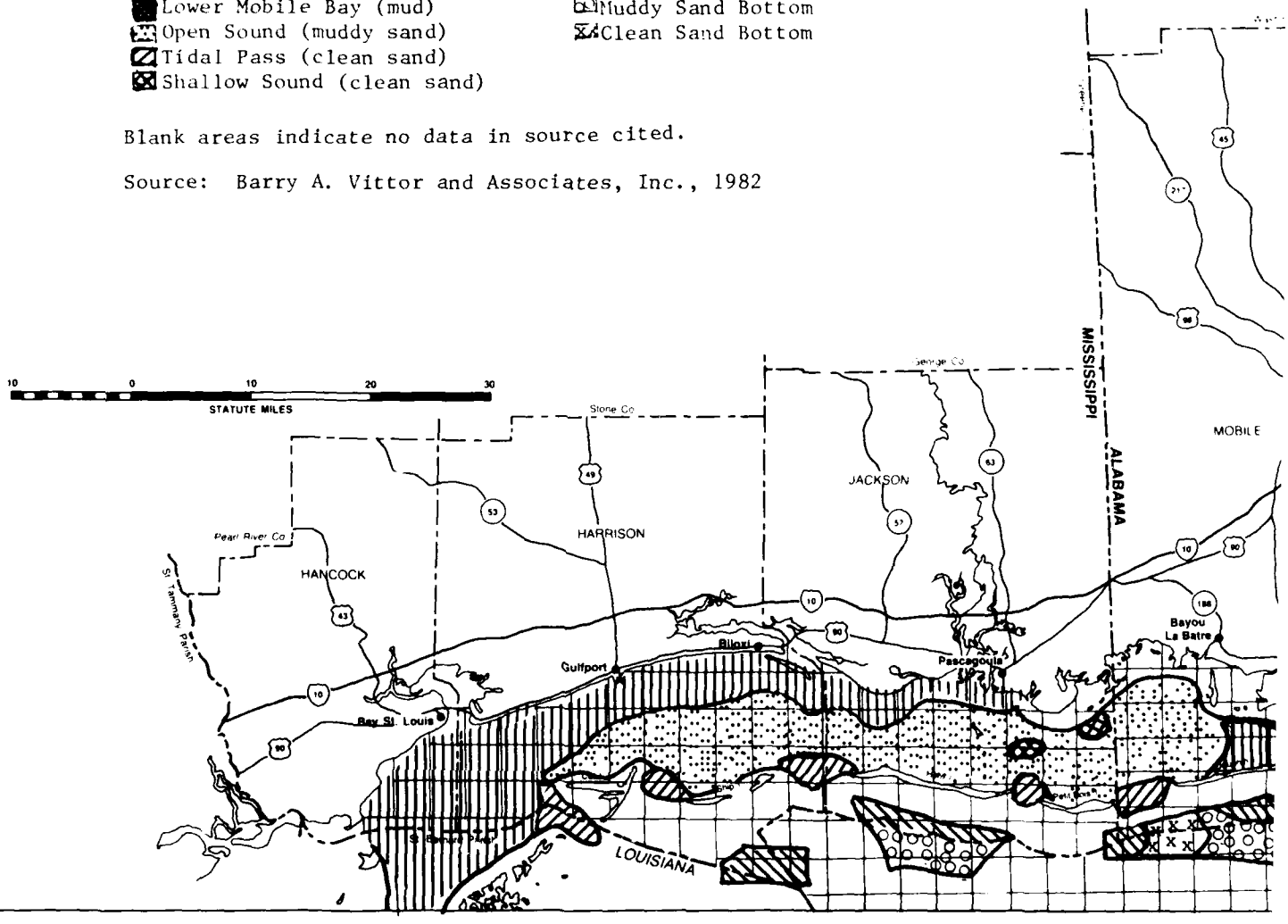
- Coastal Margin (mud)
- Lower Mobile Bay (mud)
- Open Sound (muddy sand)
- Tidal Pass (clean sand)
- Shallow Sound (clean sand)

GULF OF MEXICO

- Mud Bottom
- Muddy Sand Bottom
- Clean Sand Bottom

Blank areas indicate no data in source cited.

Source: Barry A. Vittor and Associates, Inc., 1982



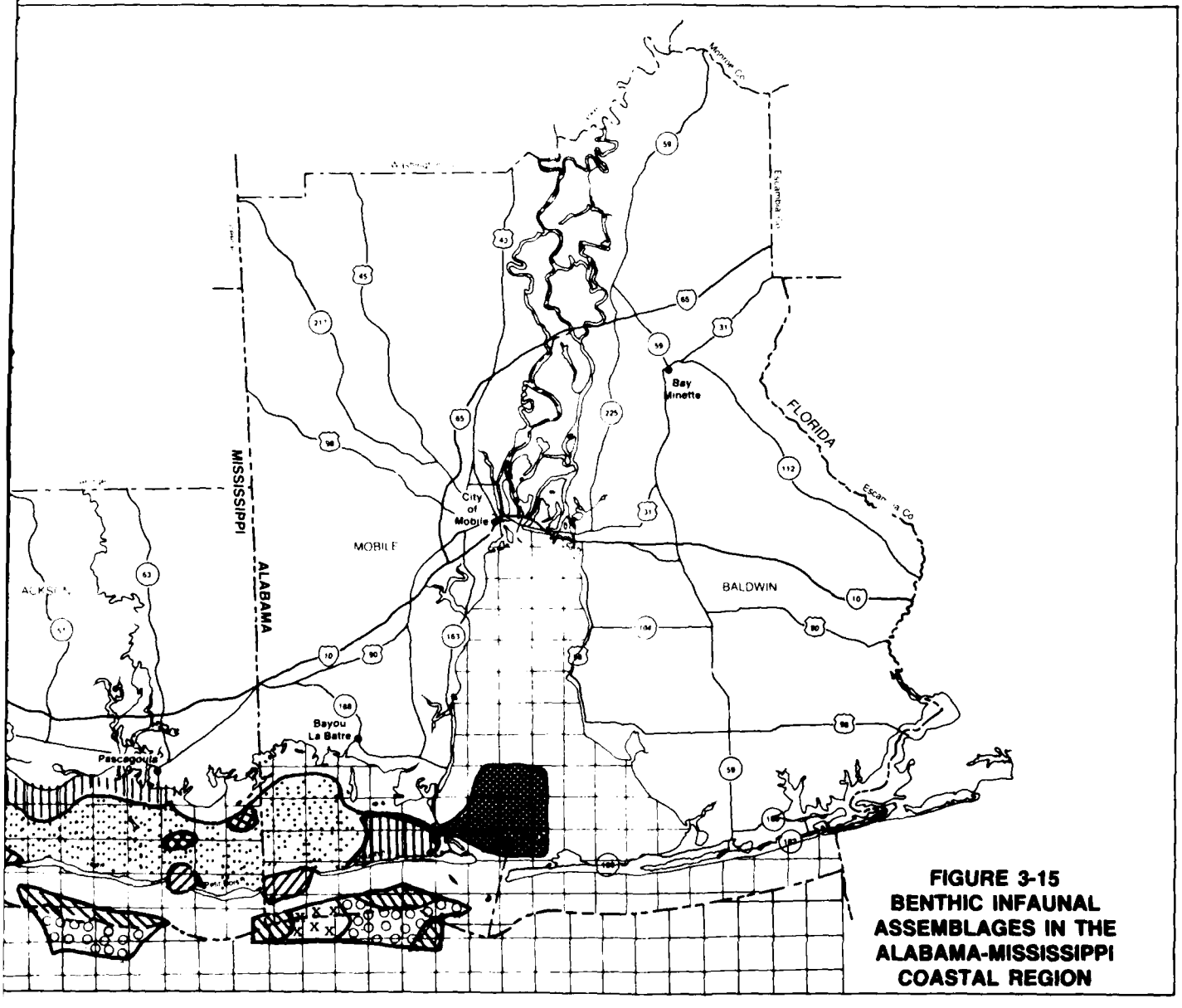
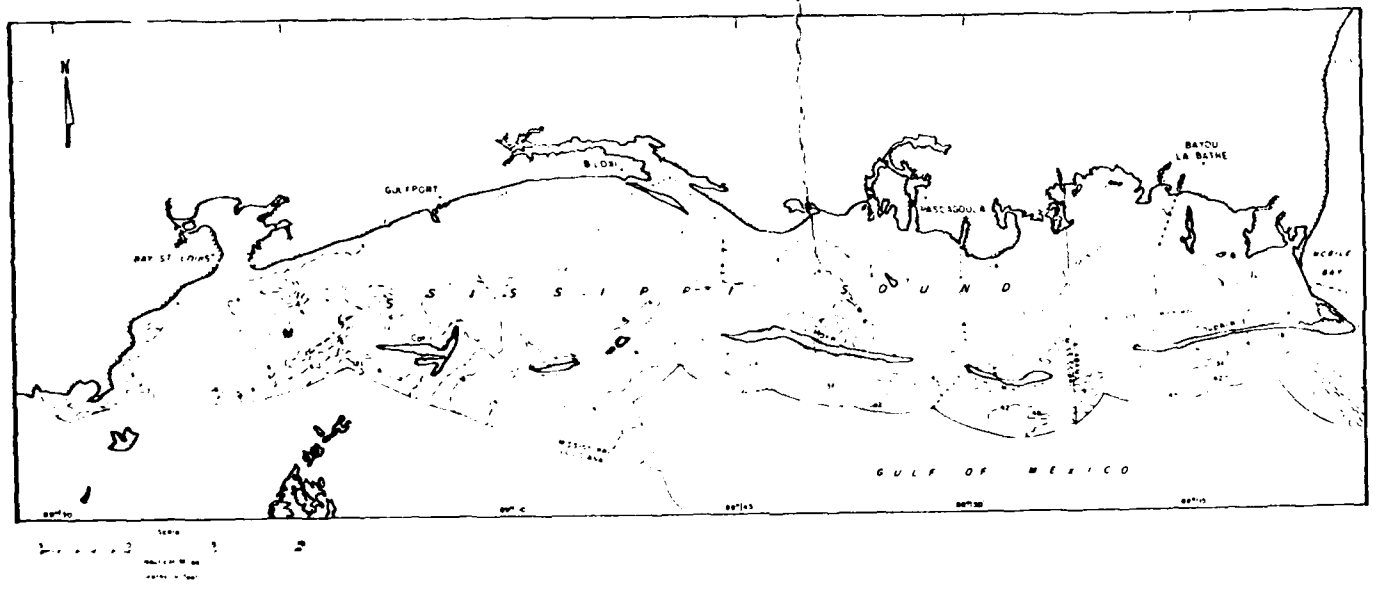


FIGURE 3-15
BENTHIC INFAUNAL ASSEMBLAGES IN THE ALABAMA-MISSISSIPPI COASTAL REGION

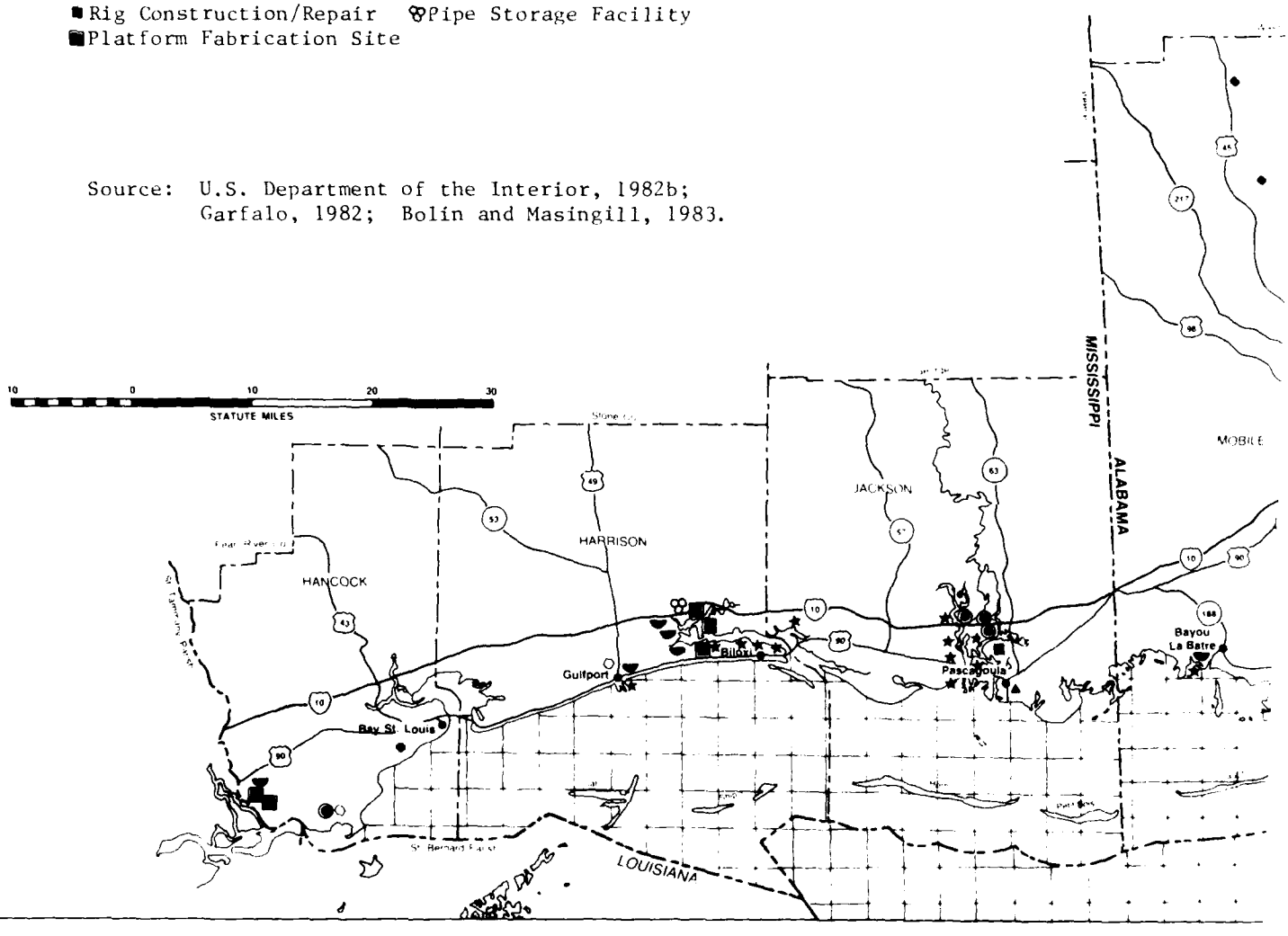


Source: U.S. Geological Survey, 1980

FIGURE 3-16
BATHYMETRY OF MISSISSIPPI SOUND

- Shipyard
- Refinery
- Processing Plant
- Rig Construction/Repair
- Platform Fabrication Site
- Service/Supply Base
- Other Petroleum Products Plant
- Oil Storage Facility
- Pipe Storage Facility

Source: U.S. Department of the Interior, 1982b; Garfalo, 1982; Bolin and Masingill, 1983.



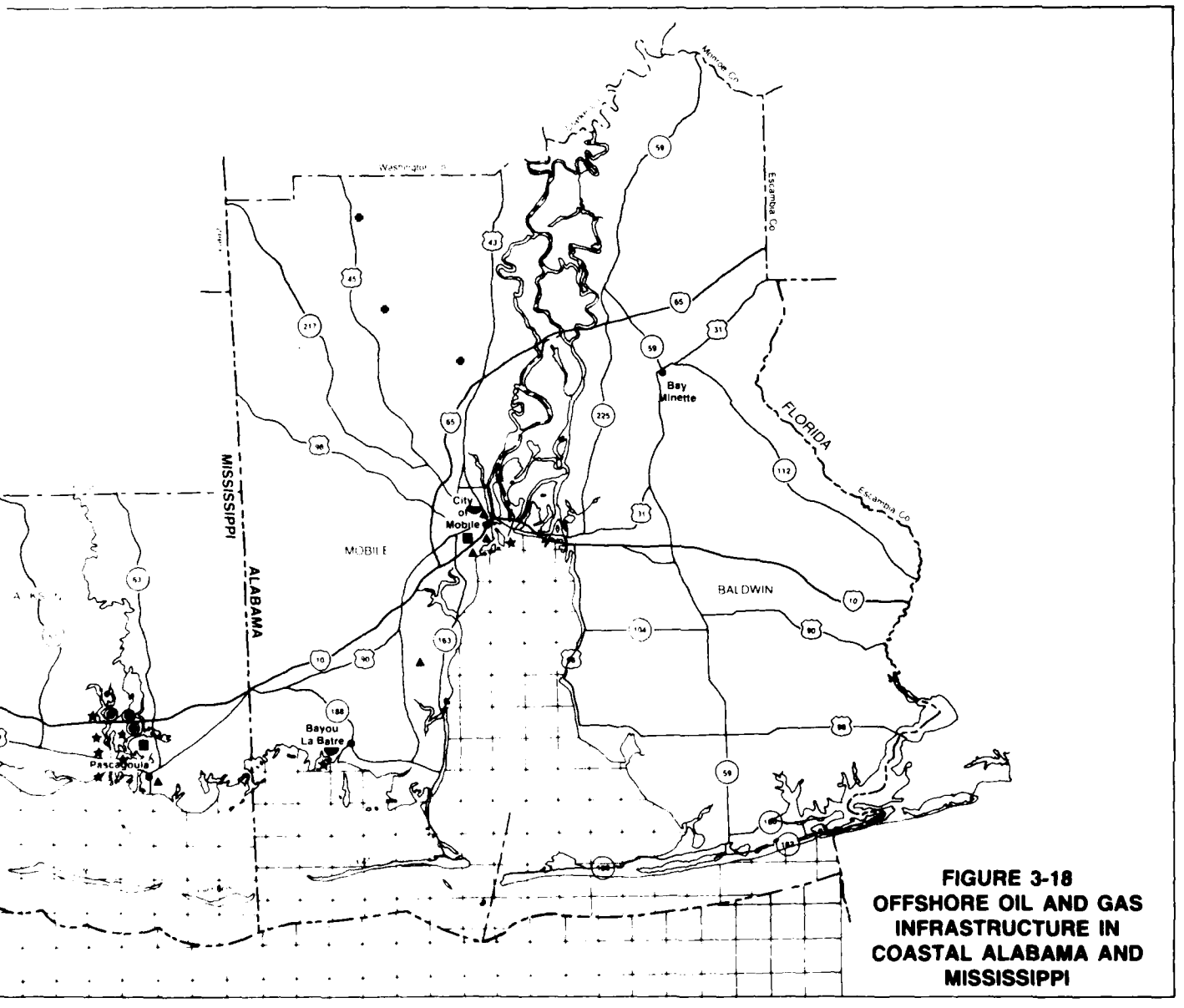
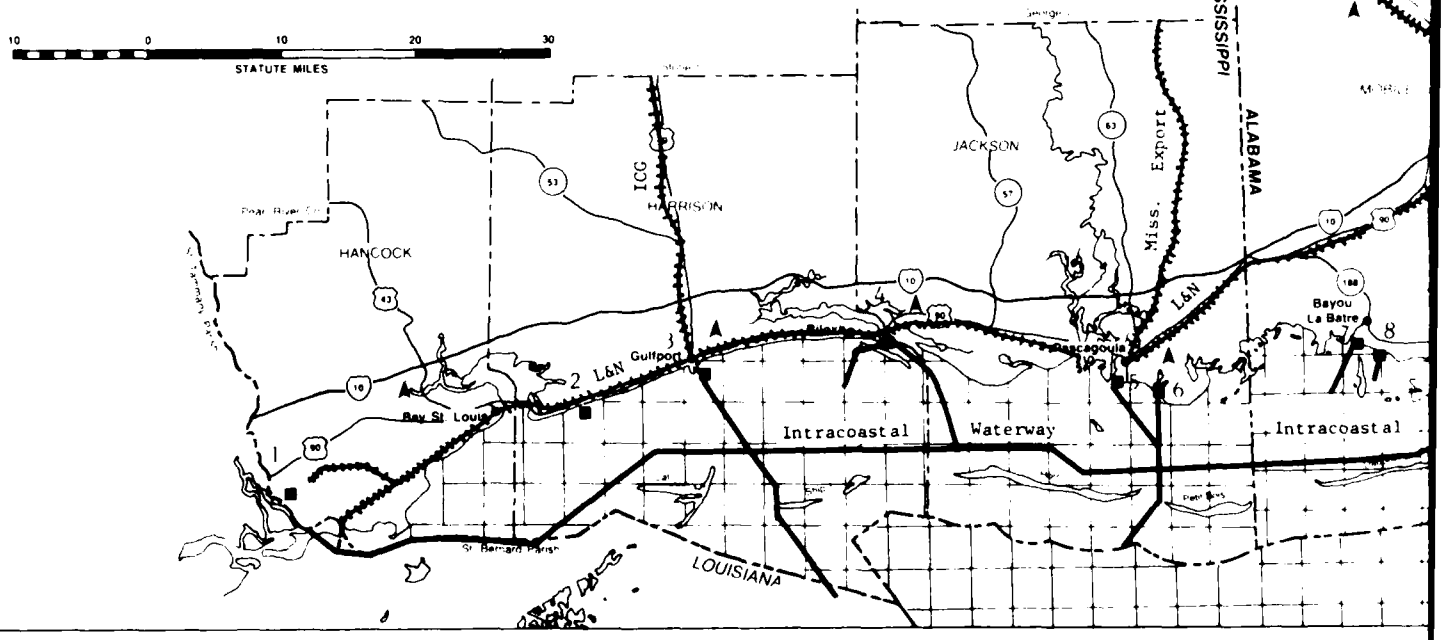


FIGURE 3-18
OFFSHORE OIL AND GAS INFRASTRUCTURE IN COASTAL ALABAMA AND MISSISSIPPI

1 Port Bienville
2 Pass Christian Harbor
3 State Port at Gulfport
4 Biloxi Harbor
5 Port of Pascagoula
6 Port of Bayou Cassotte
7 Port of Bayou La Batre
8 Bayou Coden
9 Theodore Industrial Park
10 Port of Mobile
11 Port of Chickasaw
12 Bon Secour

▲ Airport
Railroad
Interstate Highway
State Highway
Maintained Waterway Channel
U.S. Highway
■ Port

Source: Southern Mississippi Planning and Development District, 1980; South Alabama Regional Planning Commission, 1981a; Garfalo, 1982.



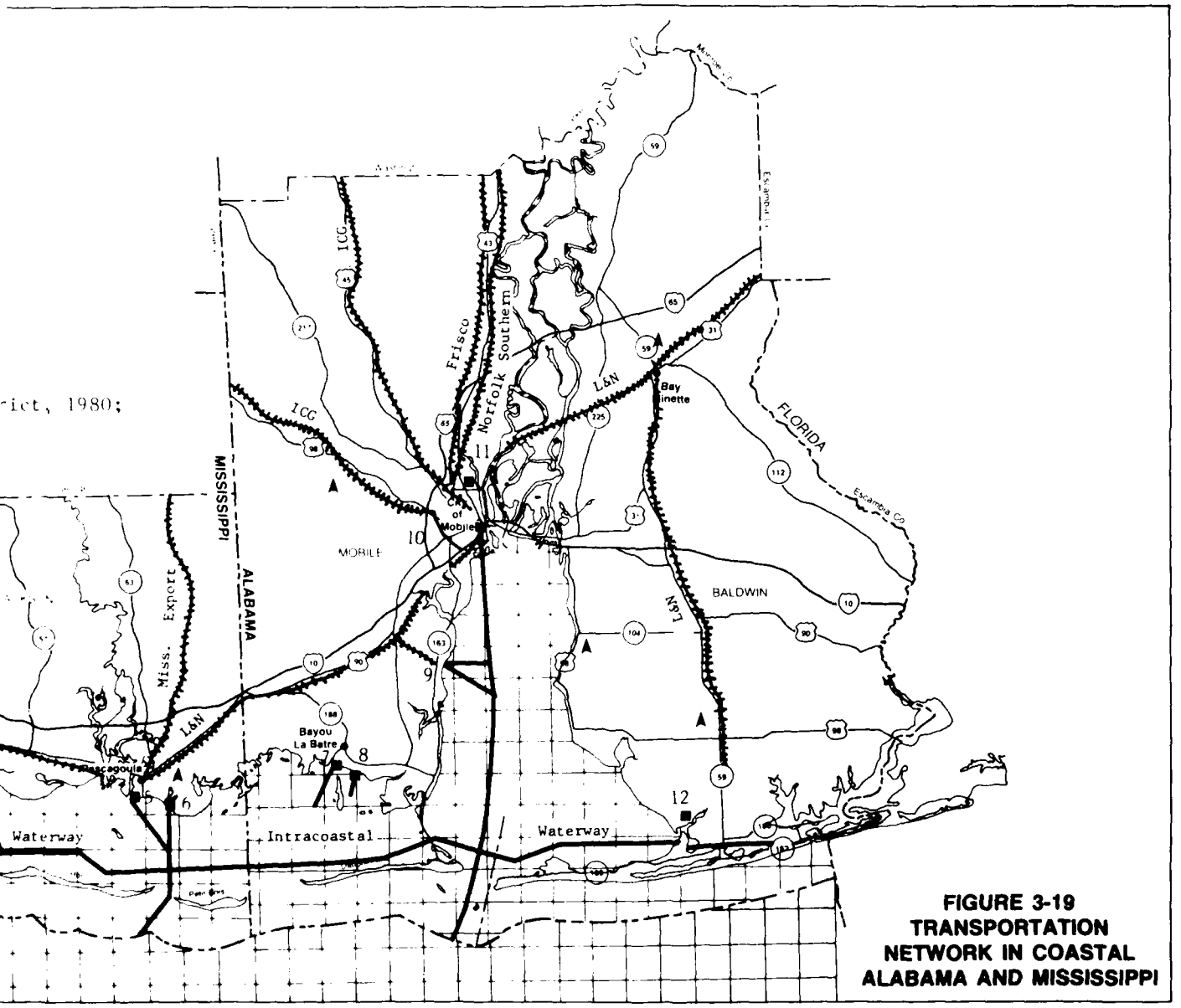
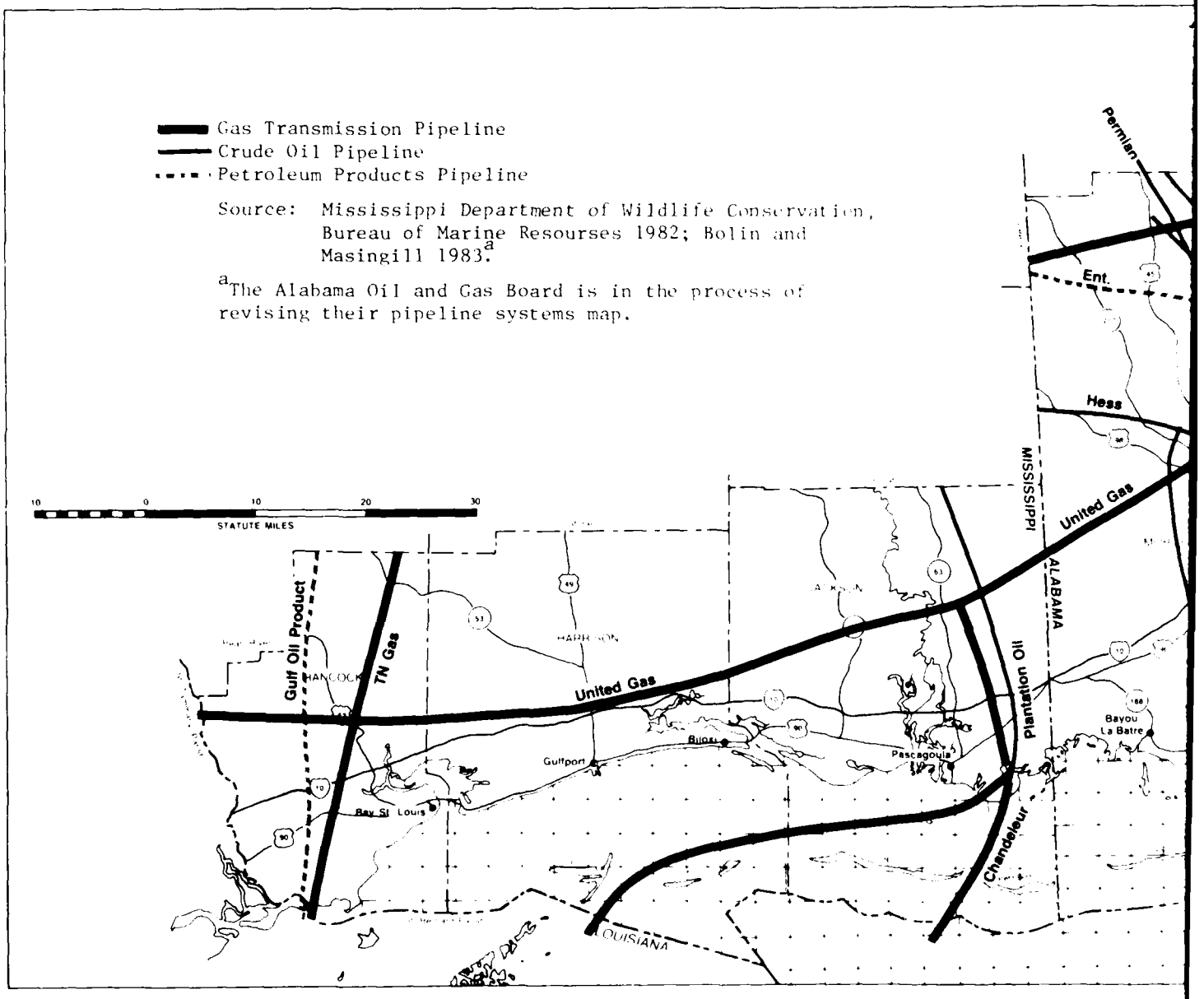


FIGURE 3-19
TRANSPORTATION NETWORK IN COASTAL ALABAMA AND MISSISSIPPI


Gas Transmission Pipeline
Crude Oil Pipeline
Petroleum Products Pipeline
Source: Mississippi Department of Wildlife Conservation, Bureau of Marine Resourses 1982; Bolin and Masingill 1983.[a]
[a]The Alabama Oil and Gas Board is in the process of revising their pipeline systems map.
10 0 10 20 30
STATUTE MILES
Permian
Ent.
Hess
MISSISSIPPI
United Gas
ALABAMA
Plantation Oil
Chandeleur
Gulf Oil Product
TN Gas
United Gas
HANCOCK
HARRISON
Gulfport
Biloxi
Pascagoula
Bay St Louis
Bayou La Batre
LOUISIANA

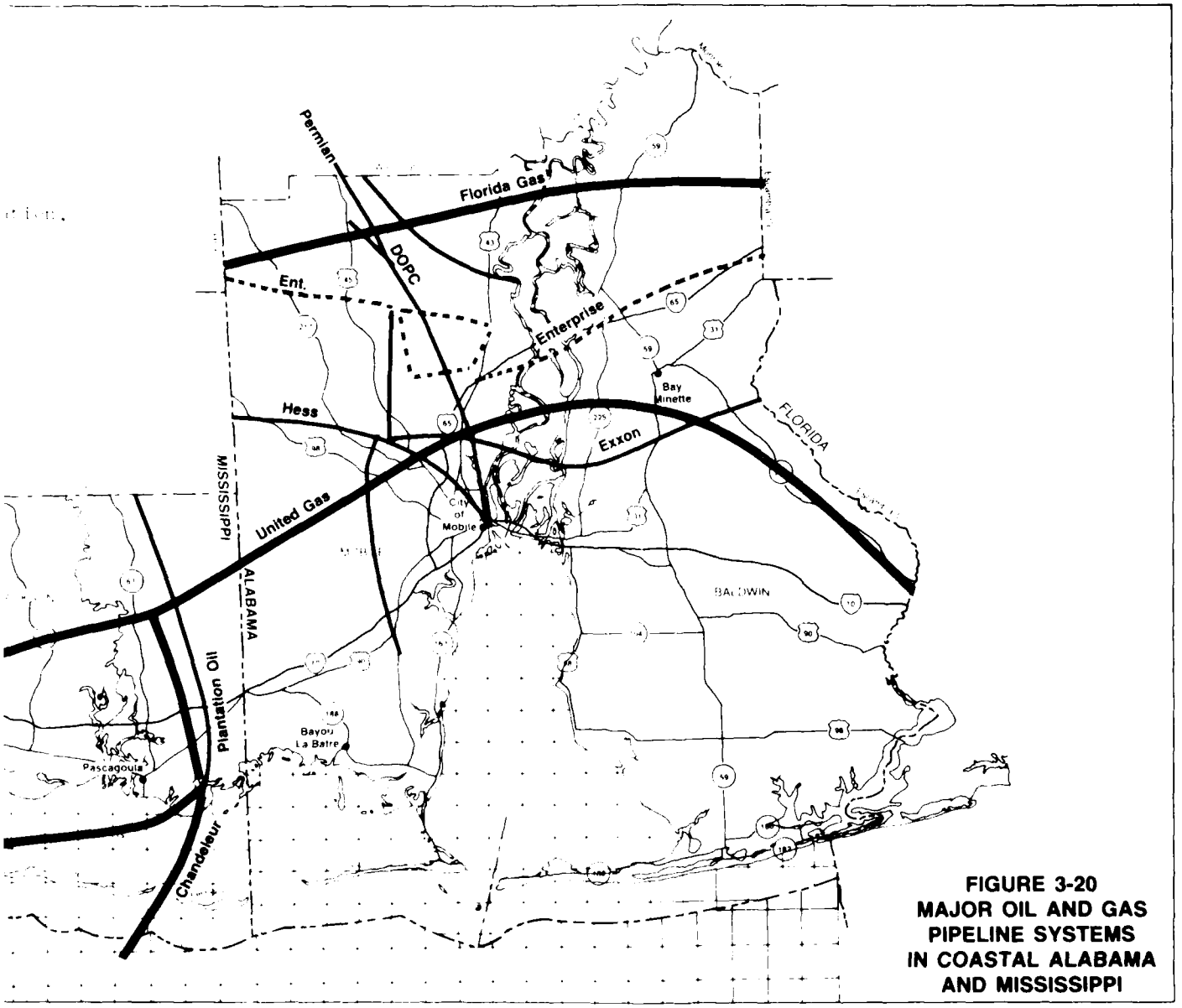


FIGURE 3-20
MAJOR OIL AND GAS PIPELINE SYSTEMS IN COASTAL ALABAMA AND MISSISSIPPI

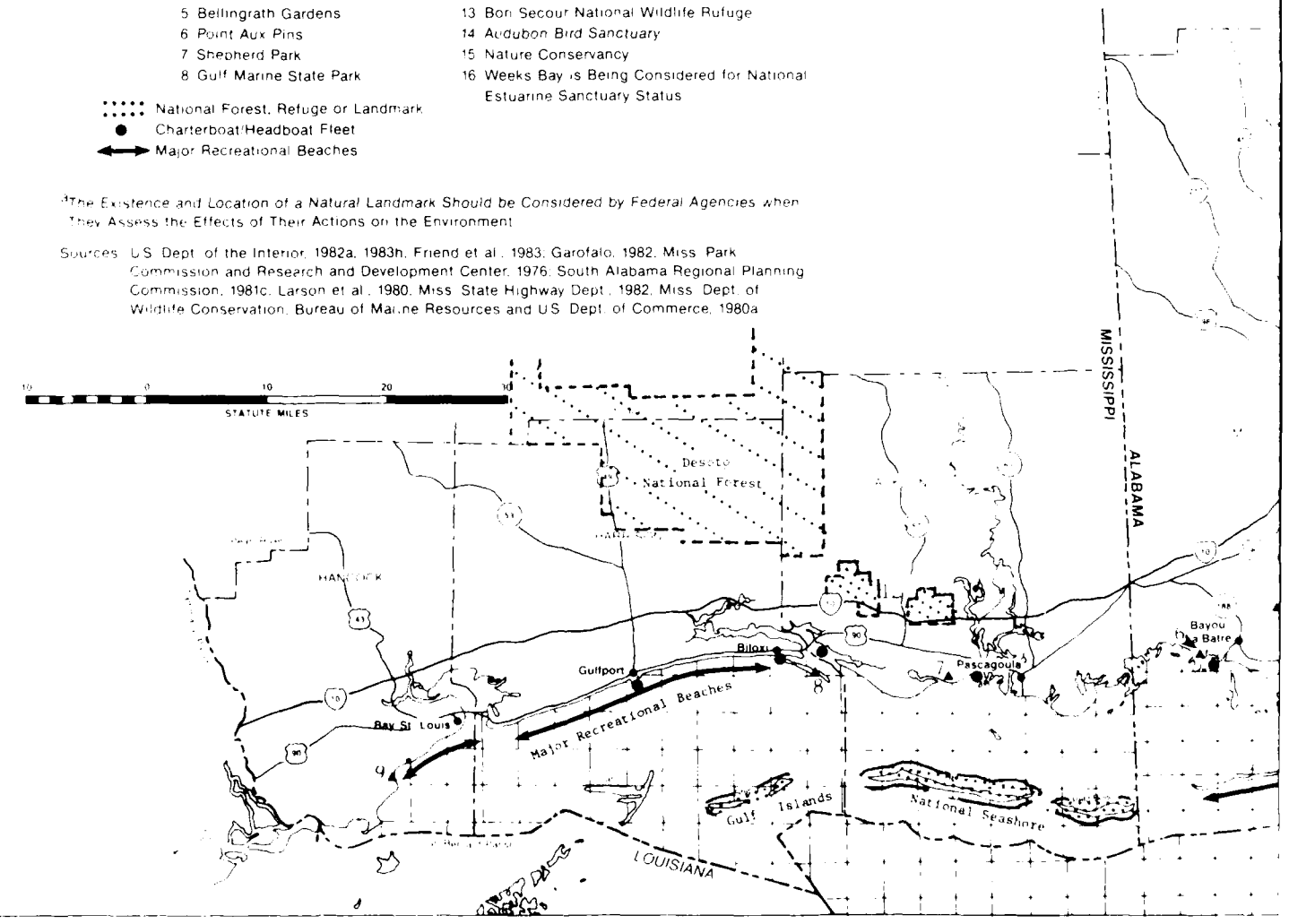
▲ State and Local Recreation Areas

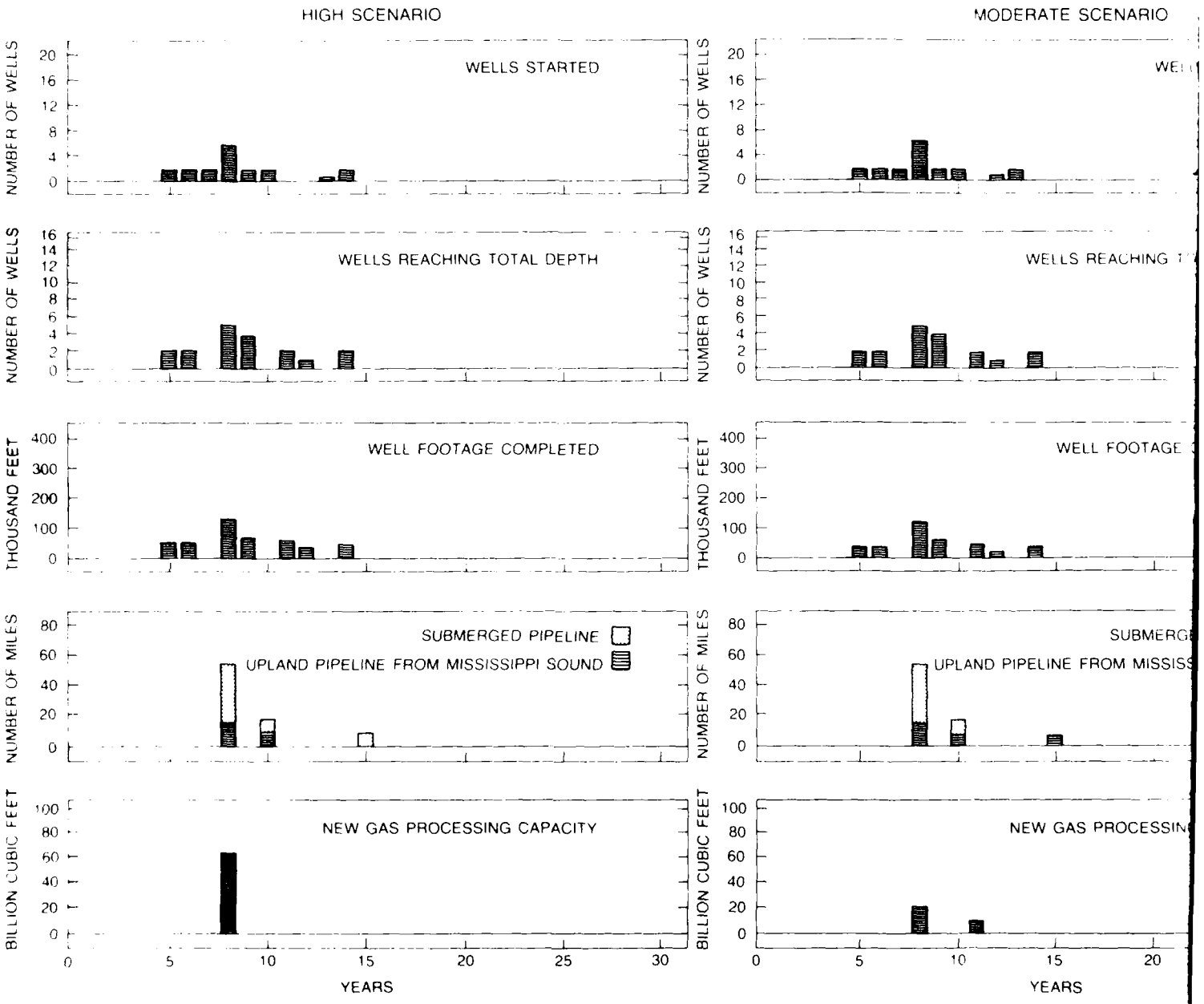
1 Meaher State Park
2 Gulf State Park
3 Fort Morgan
4 Fort Gaines
5 Bellingrath Gardens
6 Point Aux Pins
7 Shepherd Park
8 Gulf Marine State Park
9 Buccaneer State Park
10 Mobile Bay
11 Battleship Memorial Park
12 Mississippi Sandhill Crane Wildlife Refuge
13 Bon Secour National Wildlife Refuge
14 Audubon Bird Sanctuary
15 Nature Conservancy
16 Weeks Bay is Being Considered for National Estuarine Sanctuary Status

National Forest, Refuge or Landmark
Charterboat/Headboat Fleet
Major Recreational Beaches

[1]The Existence and Location of a Natural Landmark Should be Considered by Federal Agencies when They Assess the Effects of Their Actions on the Environment

Sources: U.S. Dept. of the Interior, 1982a, 1983h; Friend et al., 1983; Garofalo, 1982; Miss. Park Commission and Research and Development Center, 1976; South Alabama Regional Planning Commission, 1981c; Larson et al., 1980; Miss. State Highway Dept., 1982; Miss. Dept. of Wildlife Conservation; Bureau of Marine Resources and U.S. Dept. of Commerce, 1980a




HIGH SCENARIO
MODERATE SCENARIO
NUMBER OF WELLS
WELLS STARTED
WELLS REACHING TOTAL DEPTH
THOUSAND FEET
WELL FOOTAGE COMPLETED
NUMBER OF MILES
SUBMERGED PIPELINE
UPLAND PIPELINE FROM MISSISSIPPI SOUND
BILLION CUBIC FEET
NEW GAS PROCESSING CAPACITY
YEARS

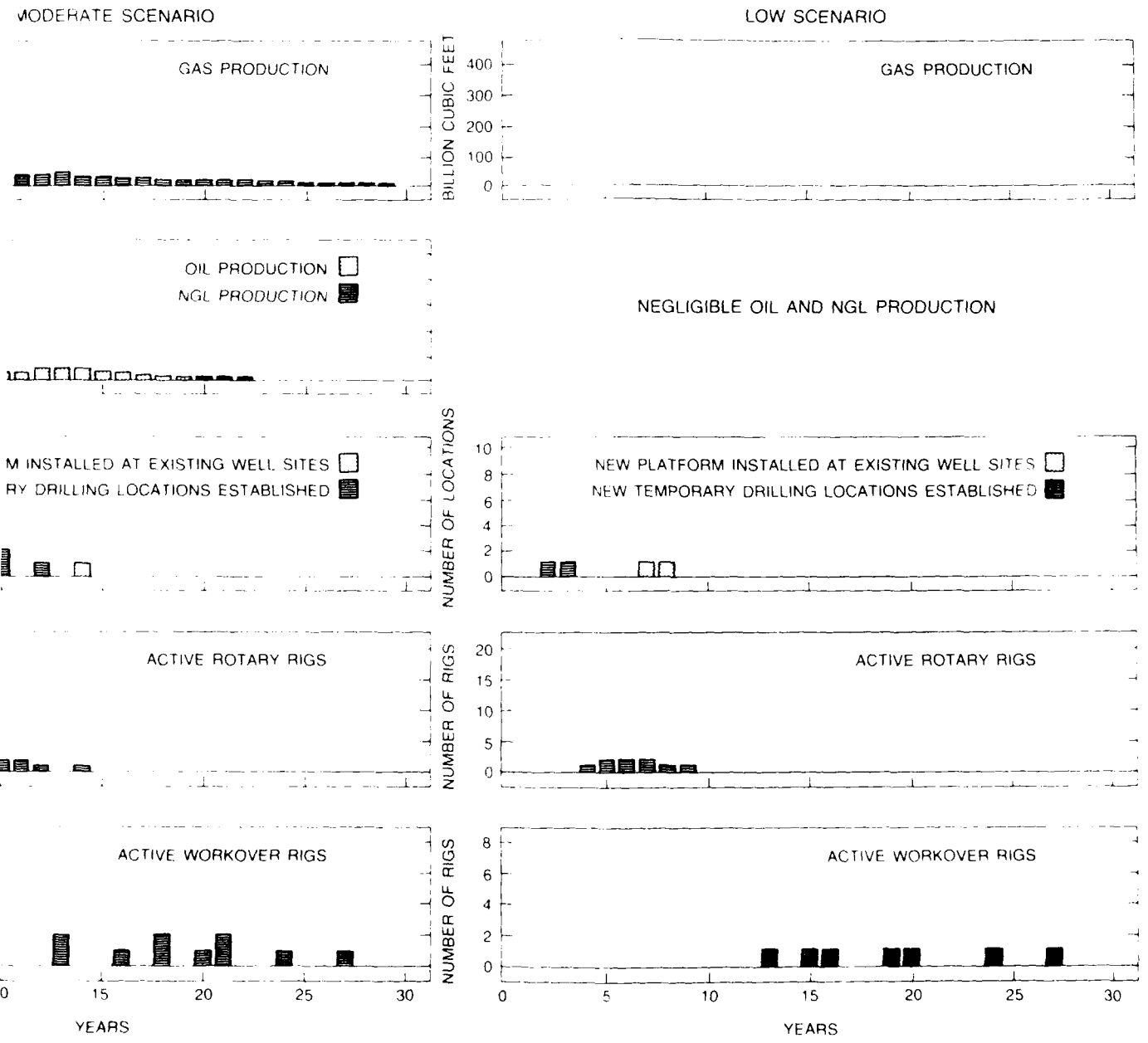
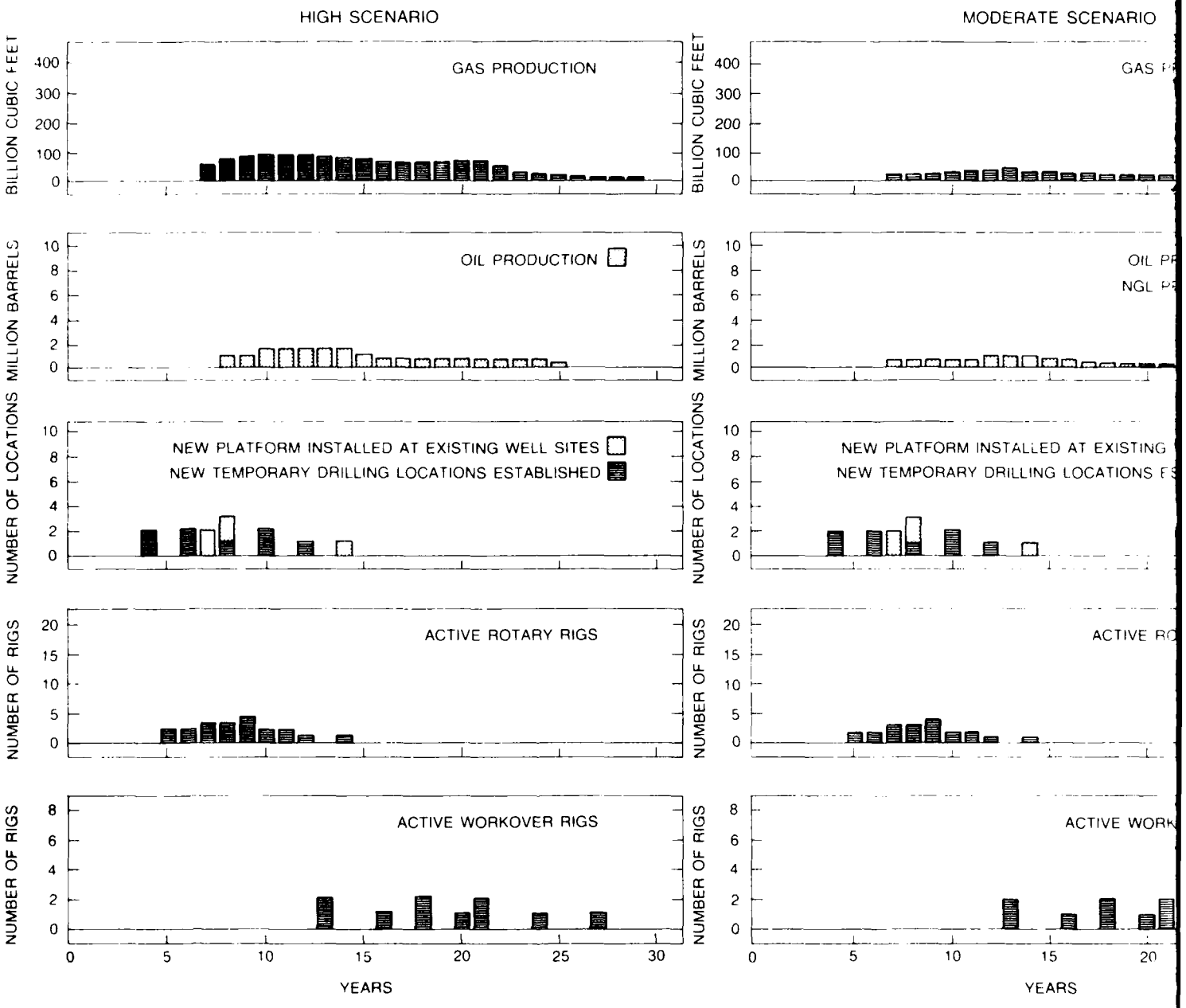


FIGURE 8-3
ACTIVITIES IN MISSISSIPPI SOUND RESULTING FROM THE HYDROCARBON RESOURCE DEVELOPMENT SCENARIOS


HIGH SCENARIO
MODERATE SCENARIO
BILLION CUBIC FEET
GAS PRODUCTION
MILLION BARRELS
OIL PRODUCTION
NUMBER OF LOCATIONS
NEW PLATFORM INSTALLED AT EXISTING WELL SITES
NEW TEMPORARY DRILLING LOCATIONS ESTABLISHED
NUMBER OF RIGS
ACTIVE ROTARY RIGS
ACTIVE WORKOVER RIGS
YEARS

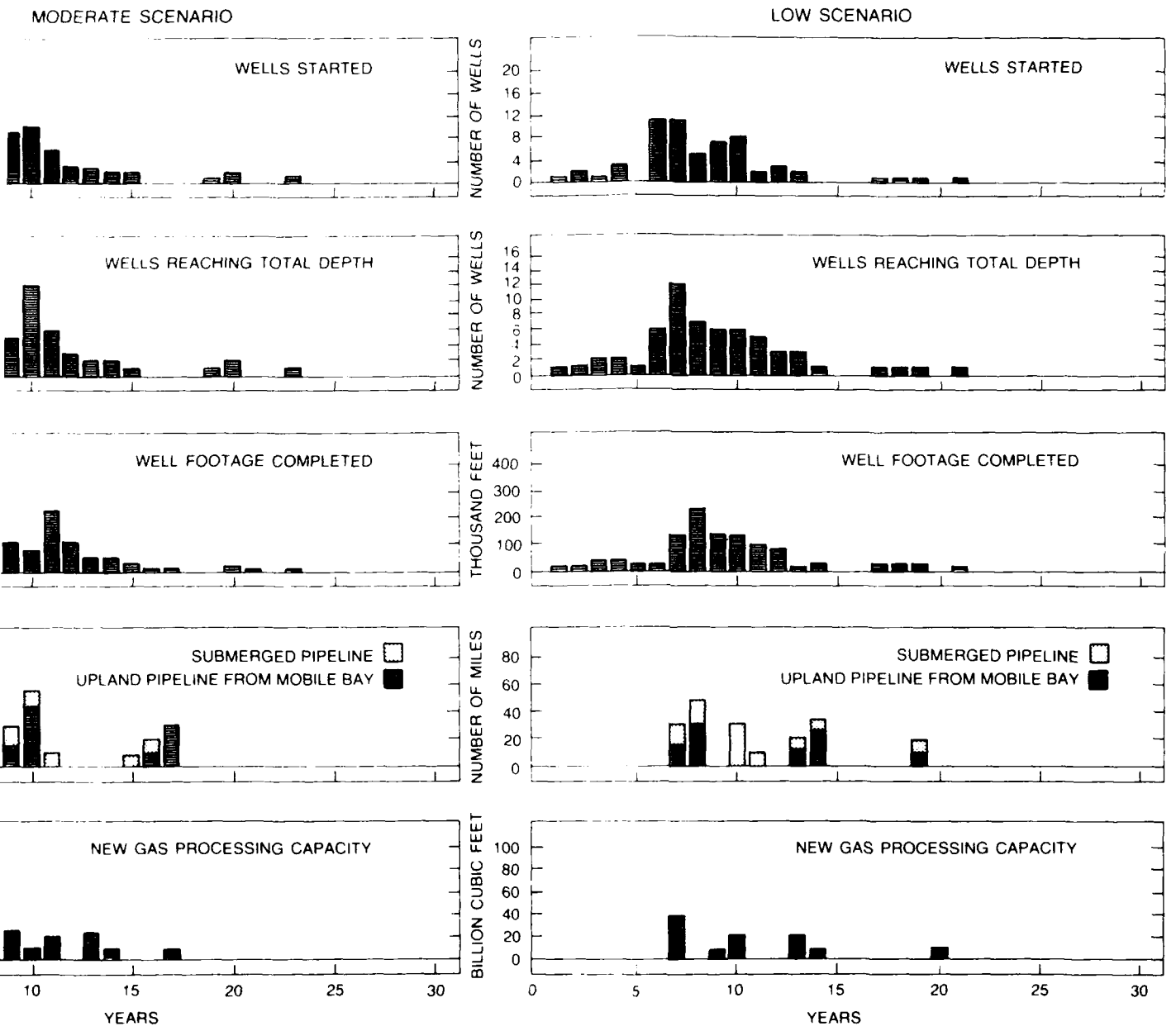
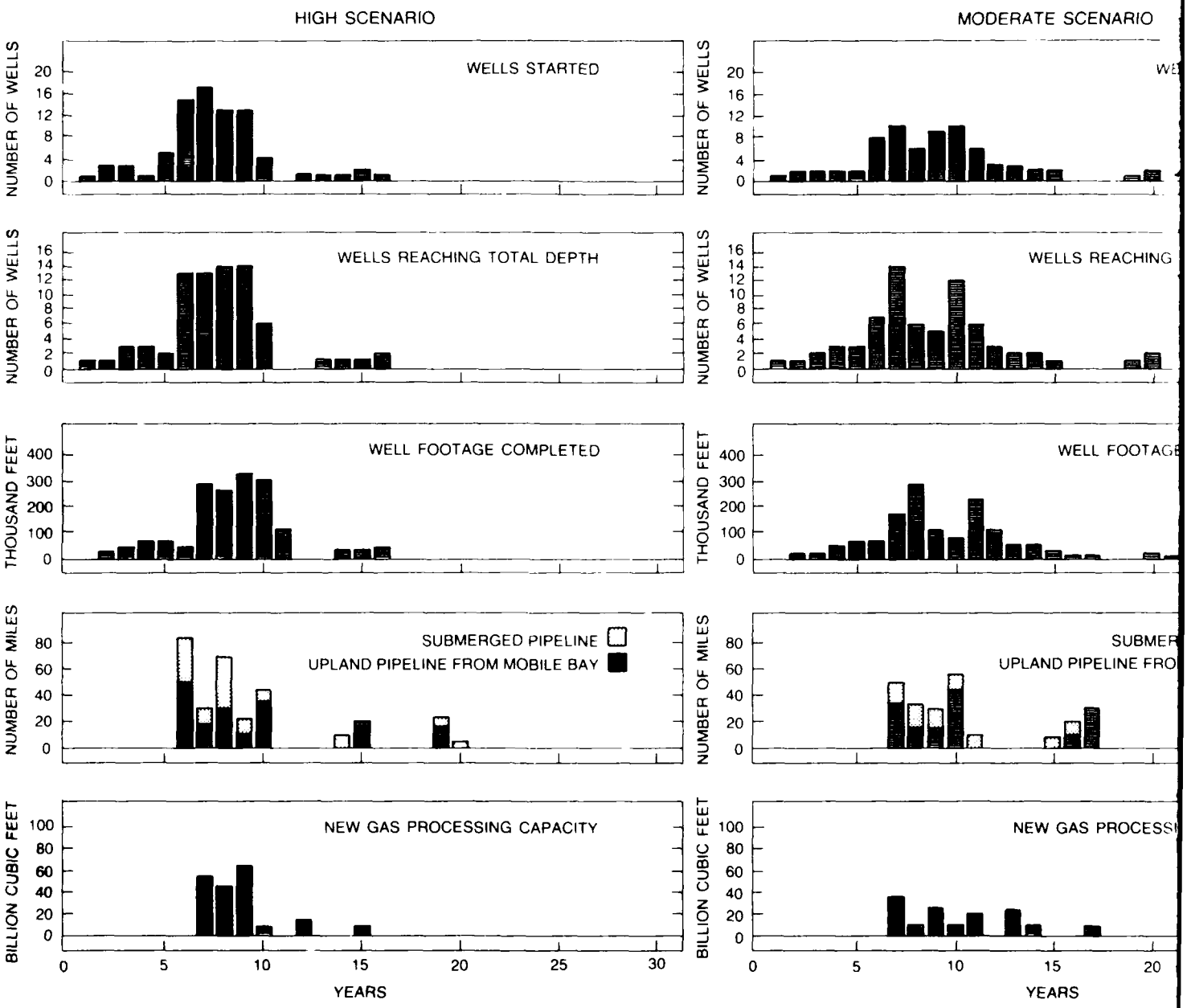


FIGURE 8-2
ACTIVITIES IN MOBILE BAY RESULTING FROM THE HYDROCARBON DEVELOPMENT SCENARIOS (CONTINUED)


HIGH SCENARIO
MODERATE SCENARIO
NUMBER OF WELLS
WELLS STARTED
WELLS REACHING TOTAL DEPTH
WELLS REACHING
THOUSAND FEET
WELL FOOTAGE COMPLETED
NUMBER OF MILES
SUBMERGED PIPELINE
UPLAND PIPELINE FROM MOBILE BAY
BILLION CUBIC FEET
NEW GAS PROCESSING CAPACITY
YEARS

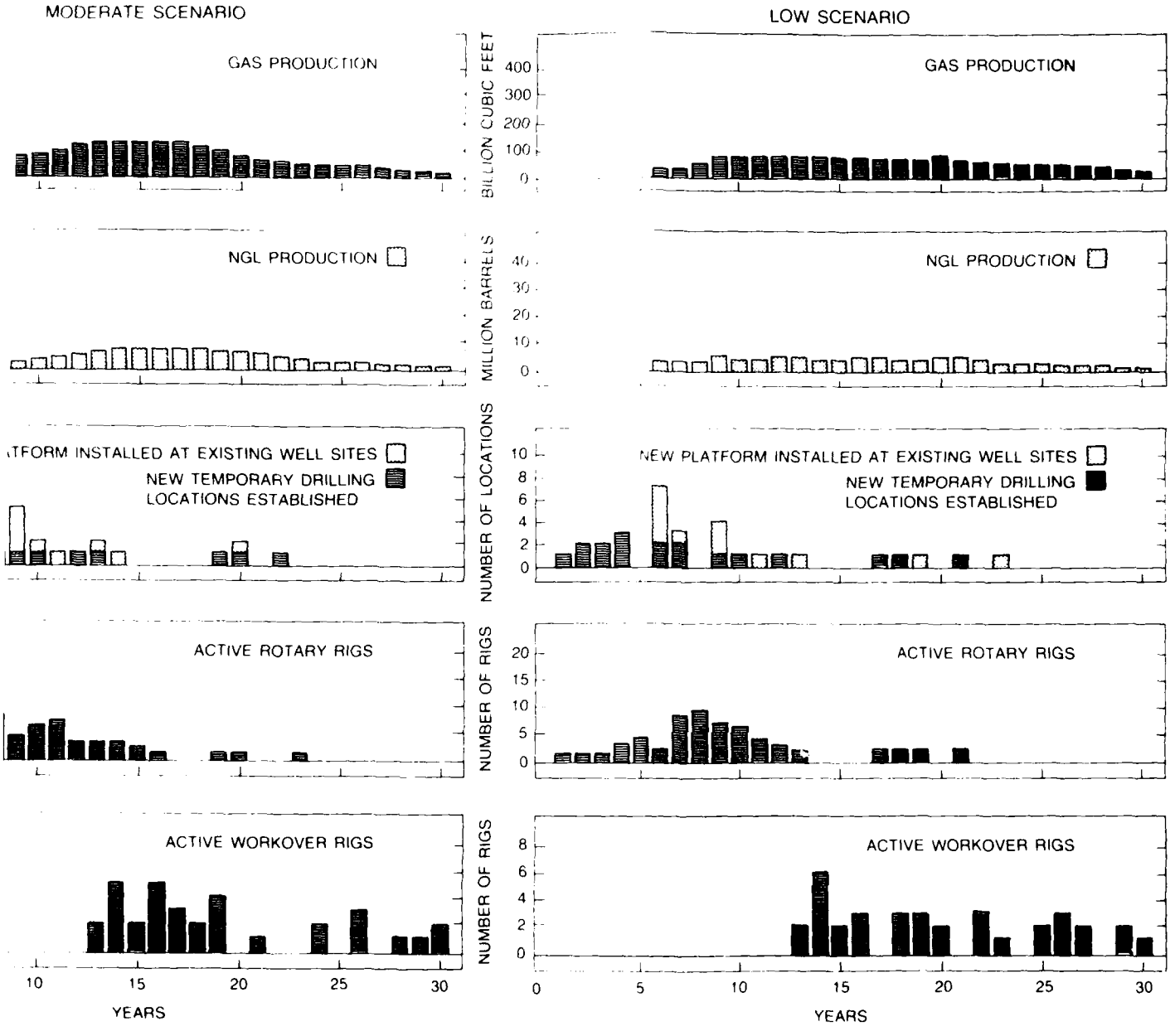
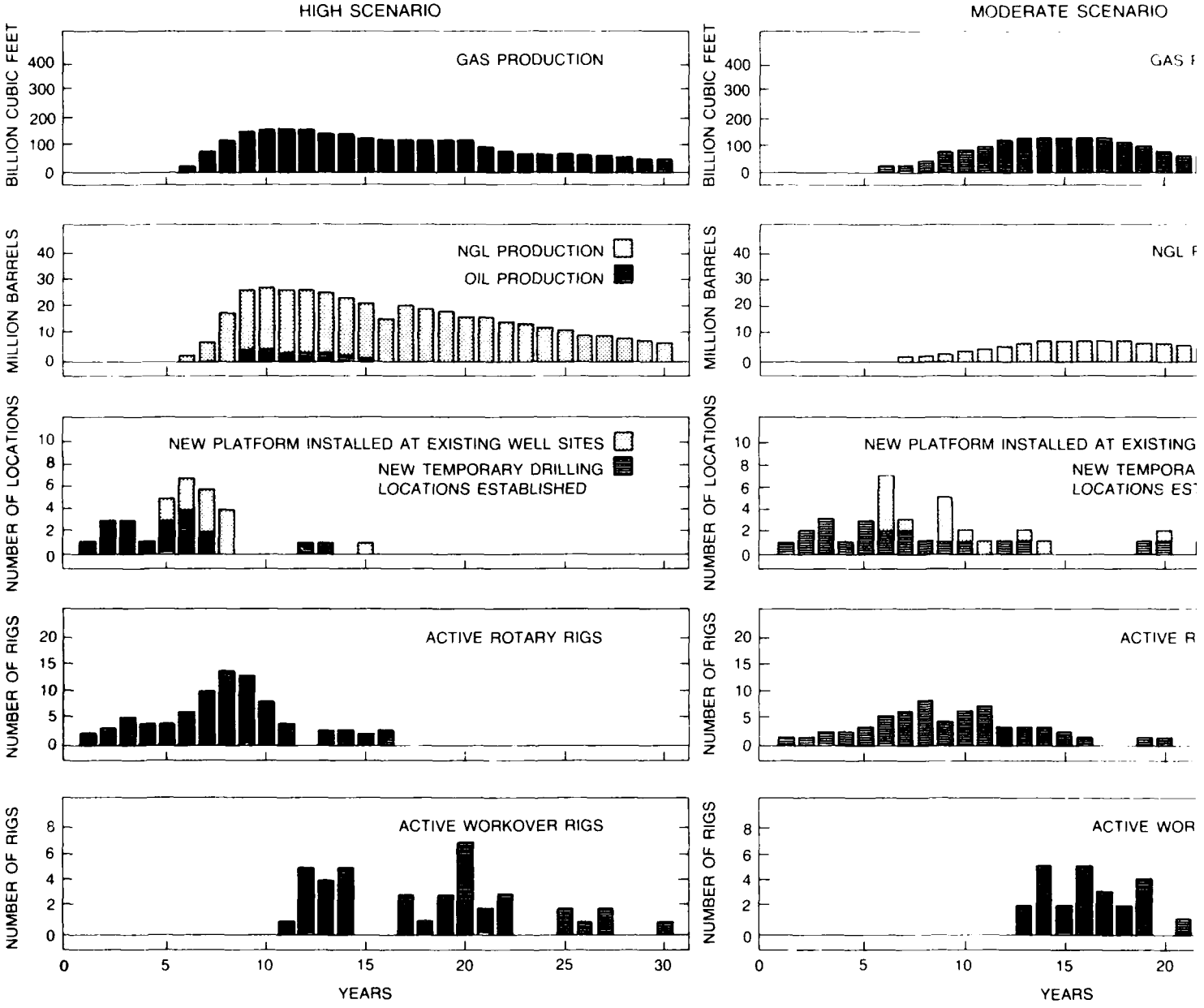


FIGURE 8-2
ACTIVITIES IN MOBILE BAY RESULTING FROM THE HYDROCARBON DEVELOPMENT SCENARIOS


HIGH SCENARIO
MODERATE SCENARIO
BILLION CUBIC FEET
GAS PRODUCTION
MILLION BARRELS
NGL PRODUCTION
OIL PRODUCTION
NUMBER OF LOCATIONS
NEW PLATFORM INSTALLED AT EXISTING WELL SITES
NEW TEMPORARY DRILLING LOCATIONS ESTABLISHED
NUMBER OF RIGS
ACTIVE ROTARY RIGS
ACTIVE WORKOVER RIGS
YEARS

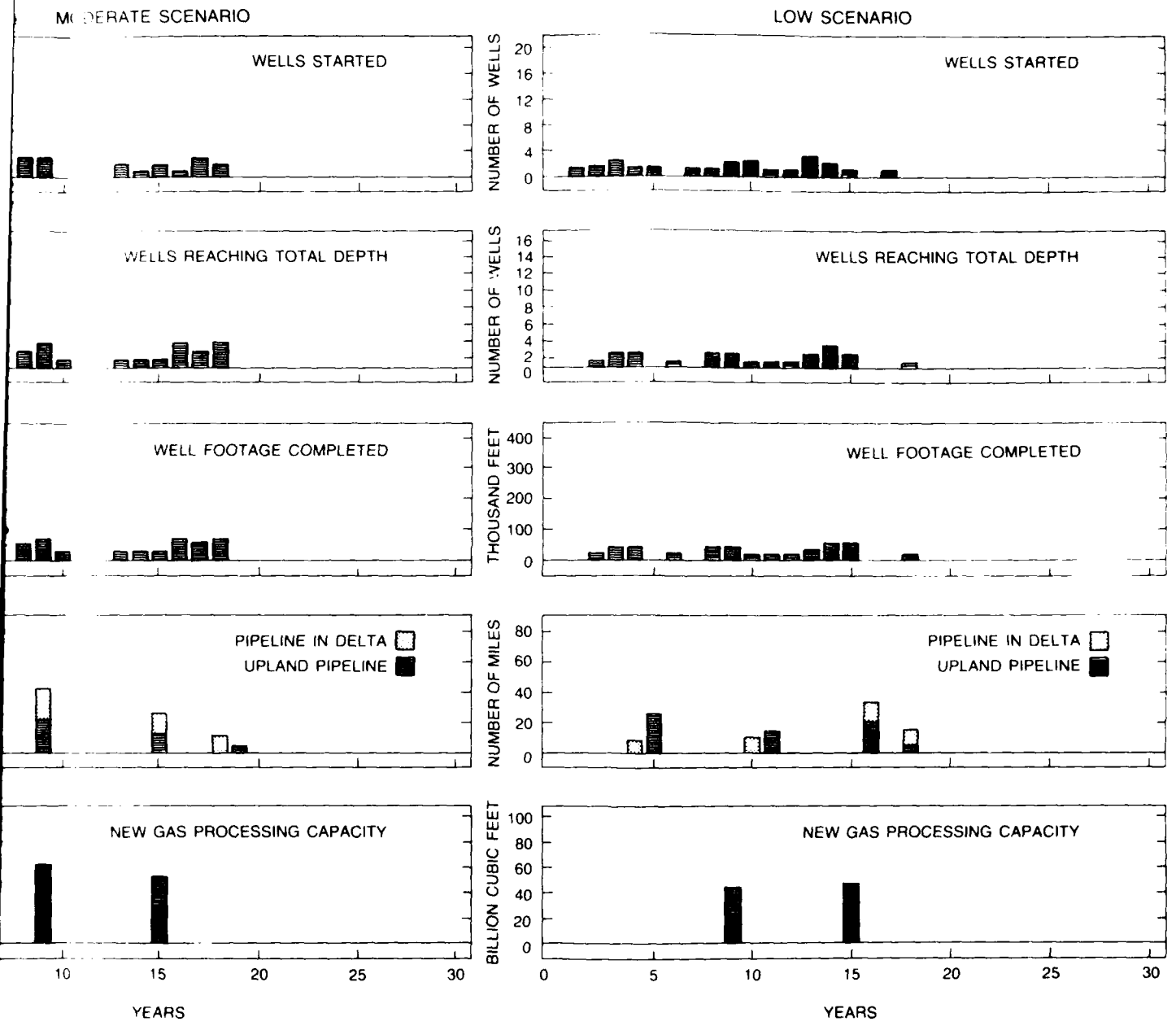
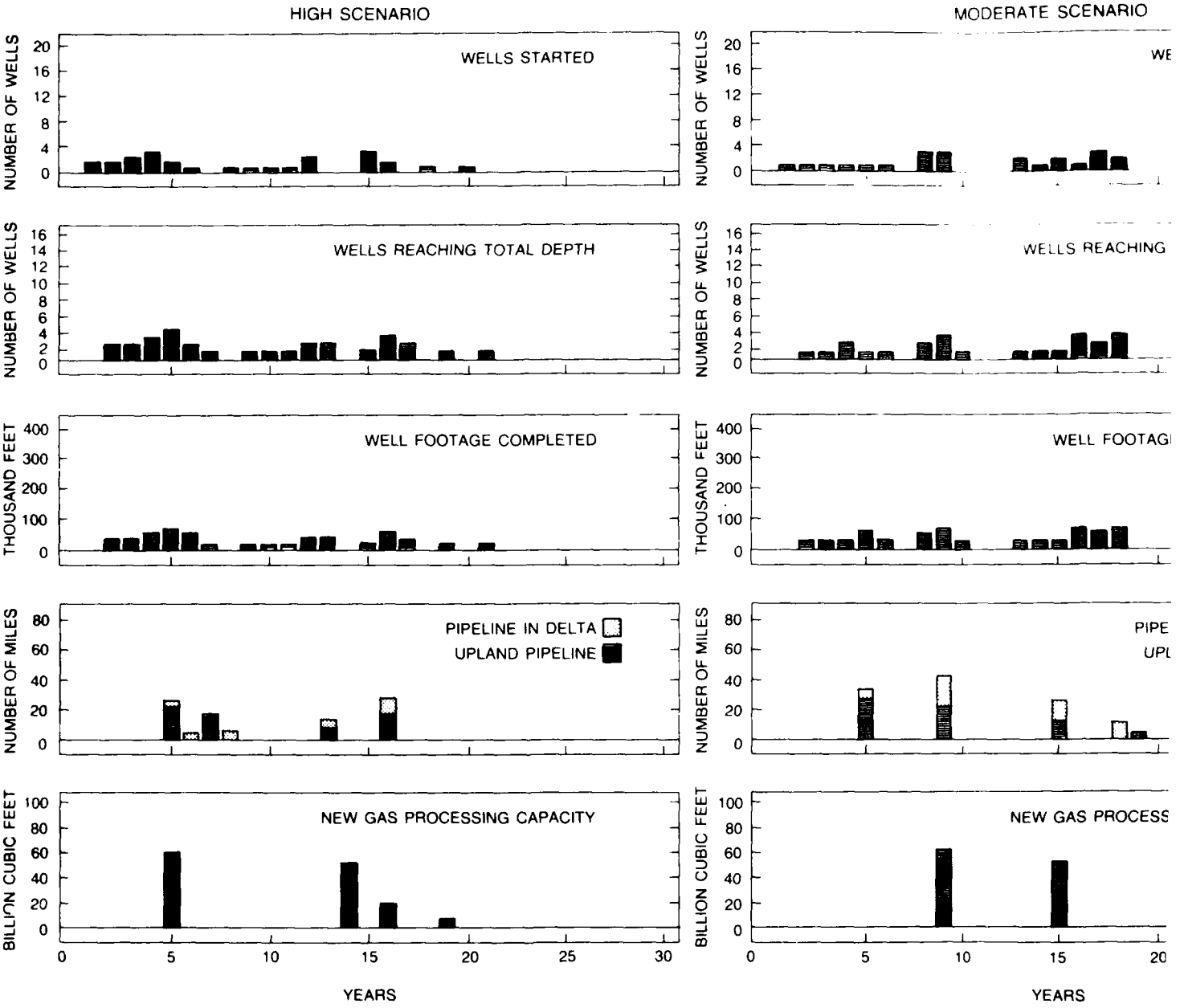


FIGURE 8-1
ACTIVITIES IN THE MOBILE DELTA RESULTING FROM THE HYDROCARBON RESOURCE DEVELOPMENT SCENARIOS (CONTINUED)


HIGH SCENARIO
MODERATE SCENARIO
WELLS STARTED
WELLS REACHING TOTAL DEPTH
WELL FOOTAGE COMPLETED
PIPELINE IN DELTA
UPLAND PIPELINE
NEW GAS PROCESSING CAPACITY
NUMBER OF WELLS
THOUSAND FEET
NUMBER OF MILES
BILLION CUBIC FEET
YEARS

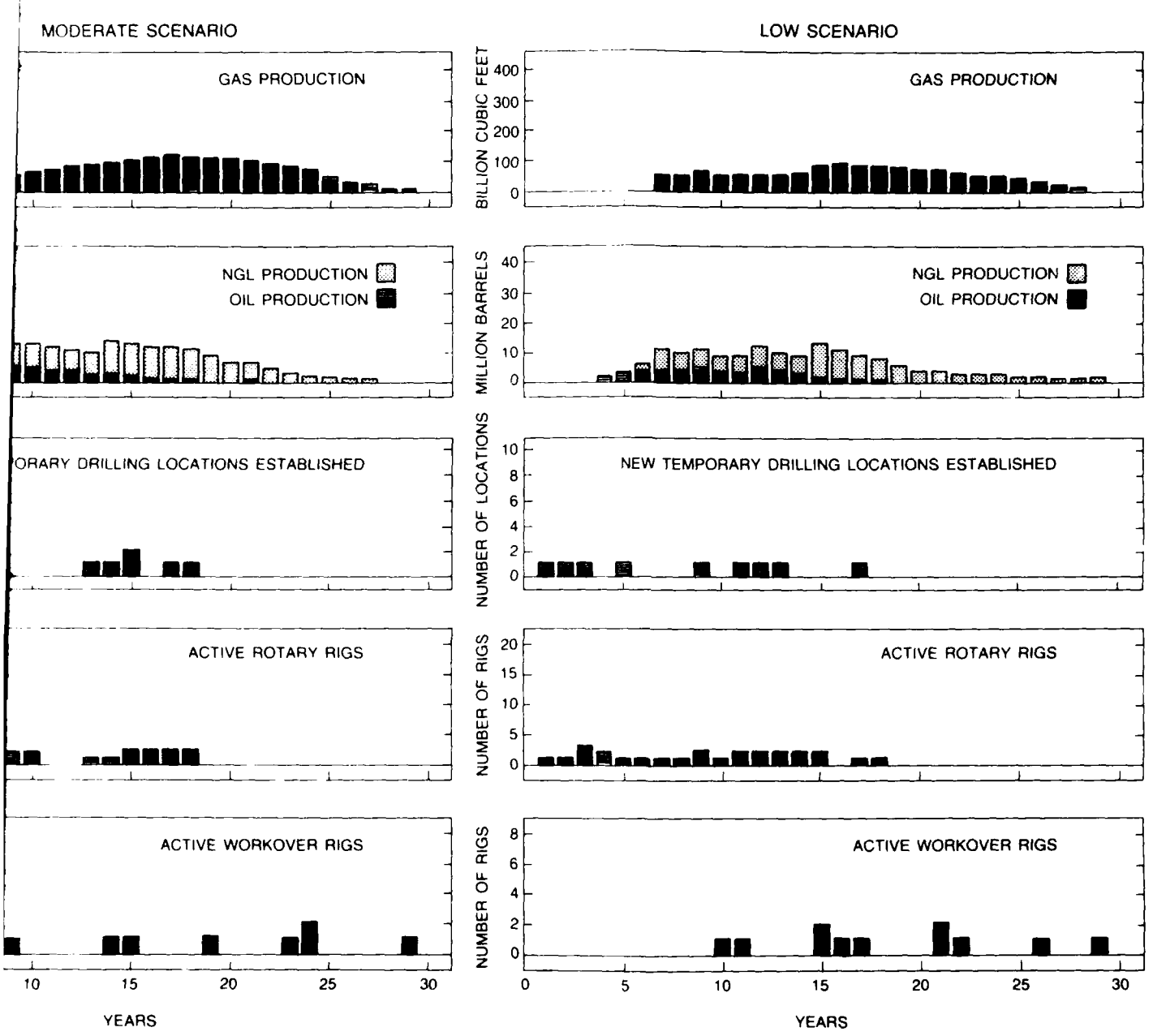
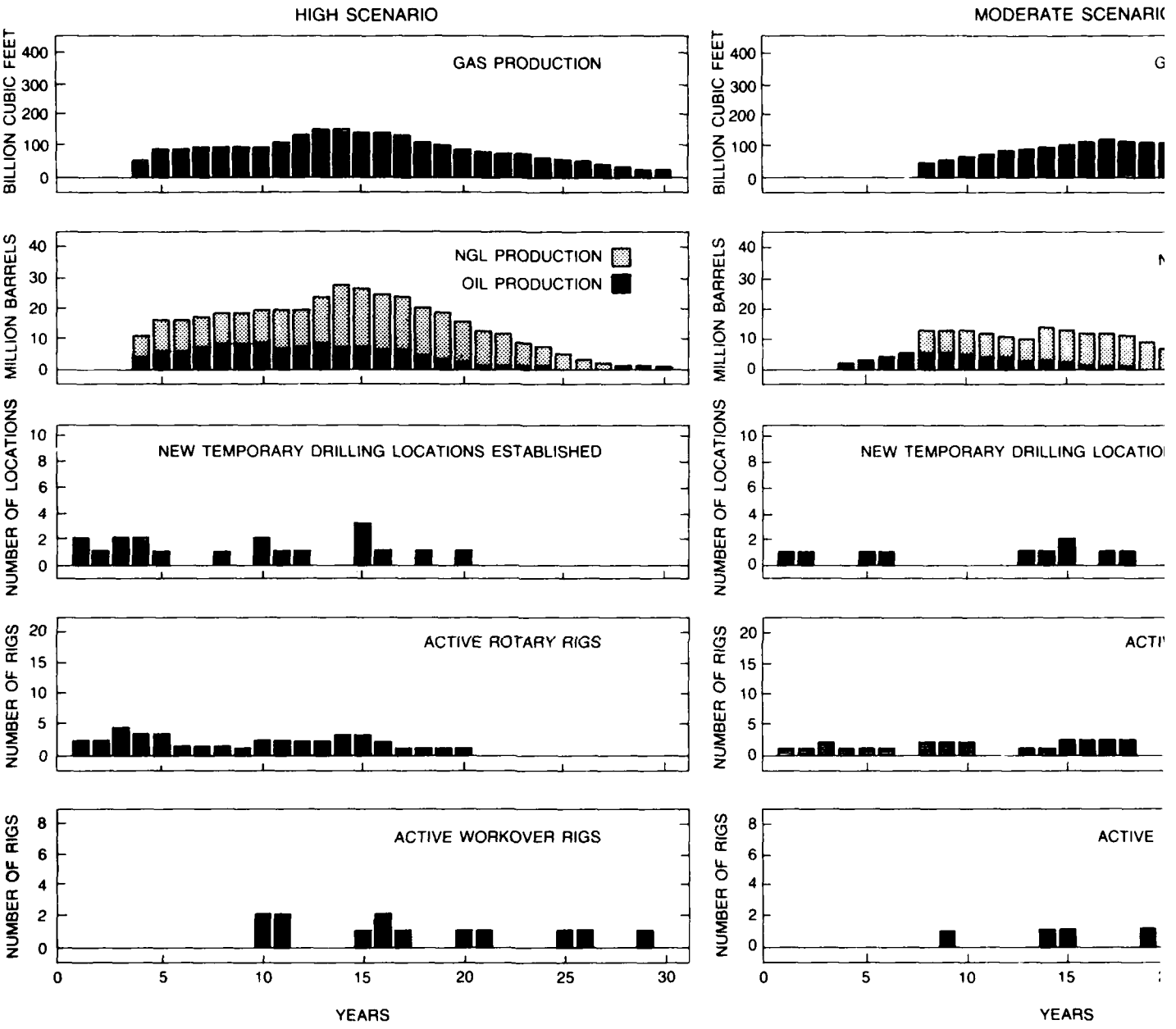


FIGURE 8-1
ACTIVITIES IN THE MOBILE DELTA RESULTING FROM THE HYDROCARBON RESOURCE DEVELOPMENT SCENARIOS


HIGH SCENARIO
MODERATE SCENARIO
GAS PRODUCTION
BILLION CUBIC FEET
400
300
200
100
0
NGL PRODUCTION
OIL PRODUCTION
MILLION BARRELS
40
30
20
10
0
NEW TEMPORARY DRILLING LOCATIONS ESTABLISHED
NUMBER OF LOCATIONS
10
8
6
4
2
0
ACTIVE ROTARY RIGS
NUMBER OF RIGS
20
15
10
5
0
ACTIVE WORKOVER RIGS
8
6
4
2
0
0
5
10
15
20
25
30
YEARS

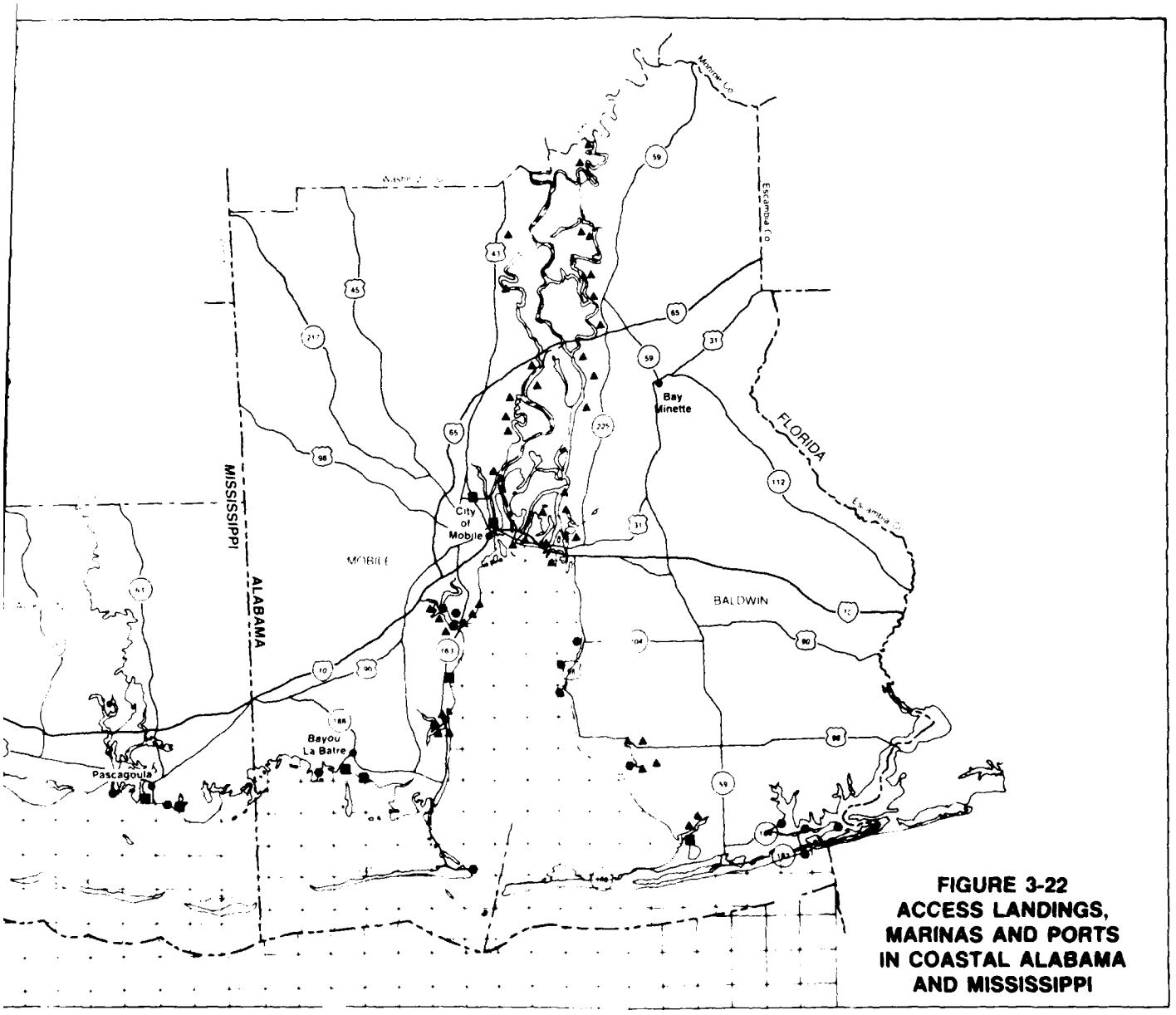
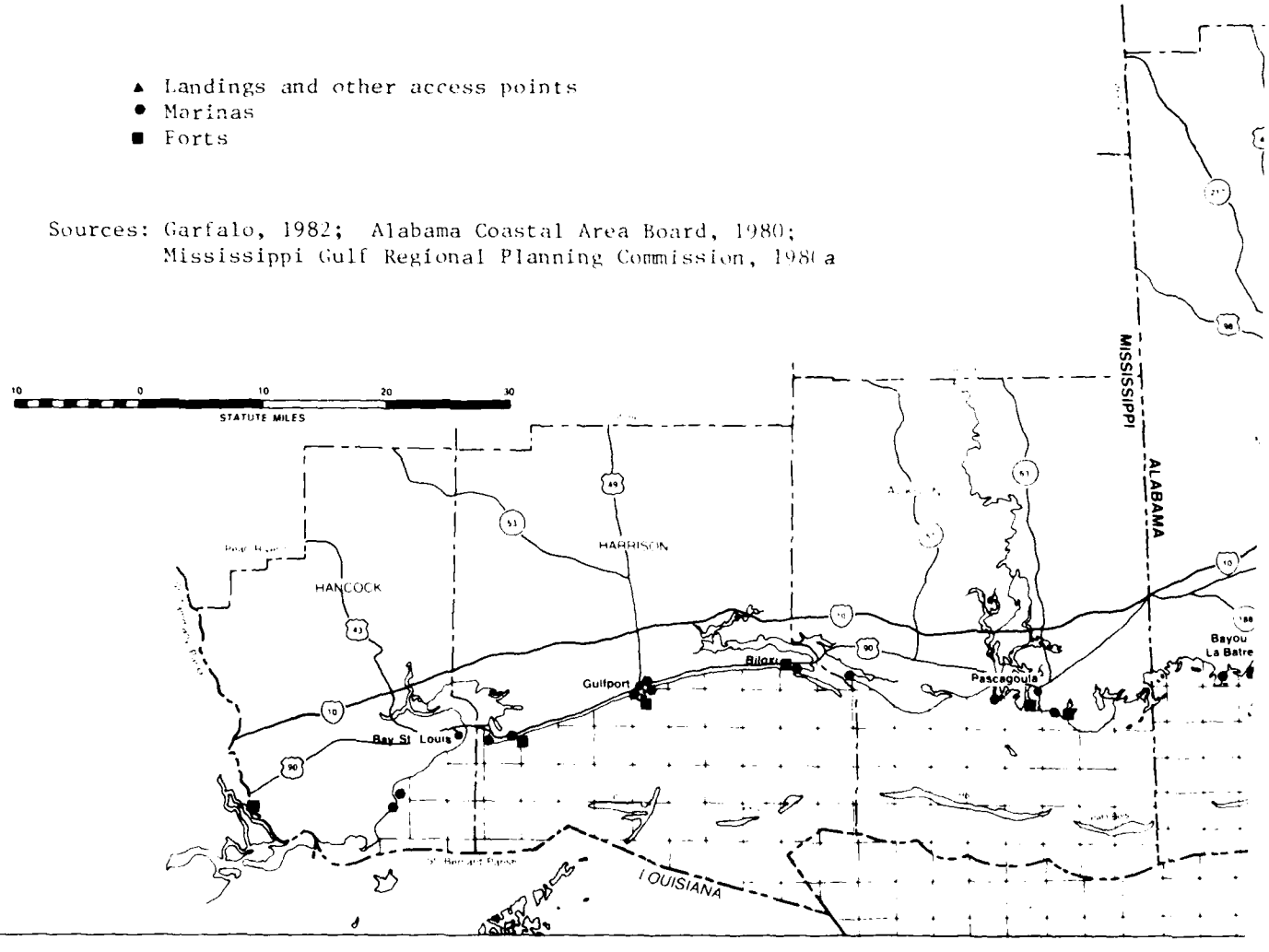


FIGURE 3-22
ACCESS LANDINGS, MARINAS AND PORTS IN COASTAL ALABAMA AND MISSISSIPPI

▲ Landings and other access points
● Marinas
■ Forts

Sources: Garfalo, 1982; Alabama Coastal Area Board, 1980;
Mississippi Gulf Regional Planning Commission, 1980a



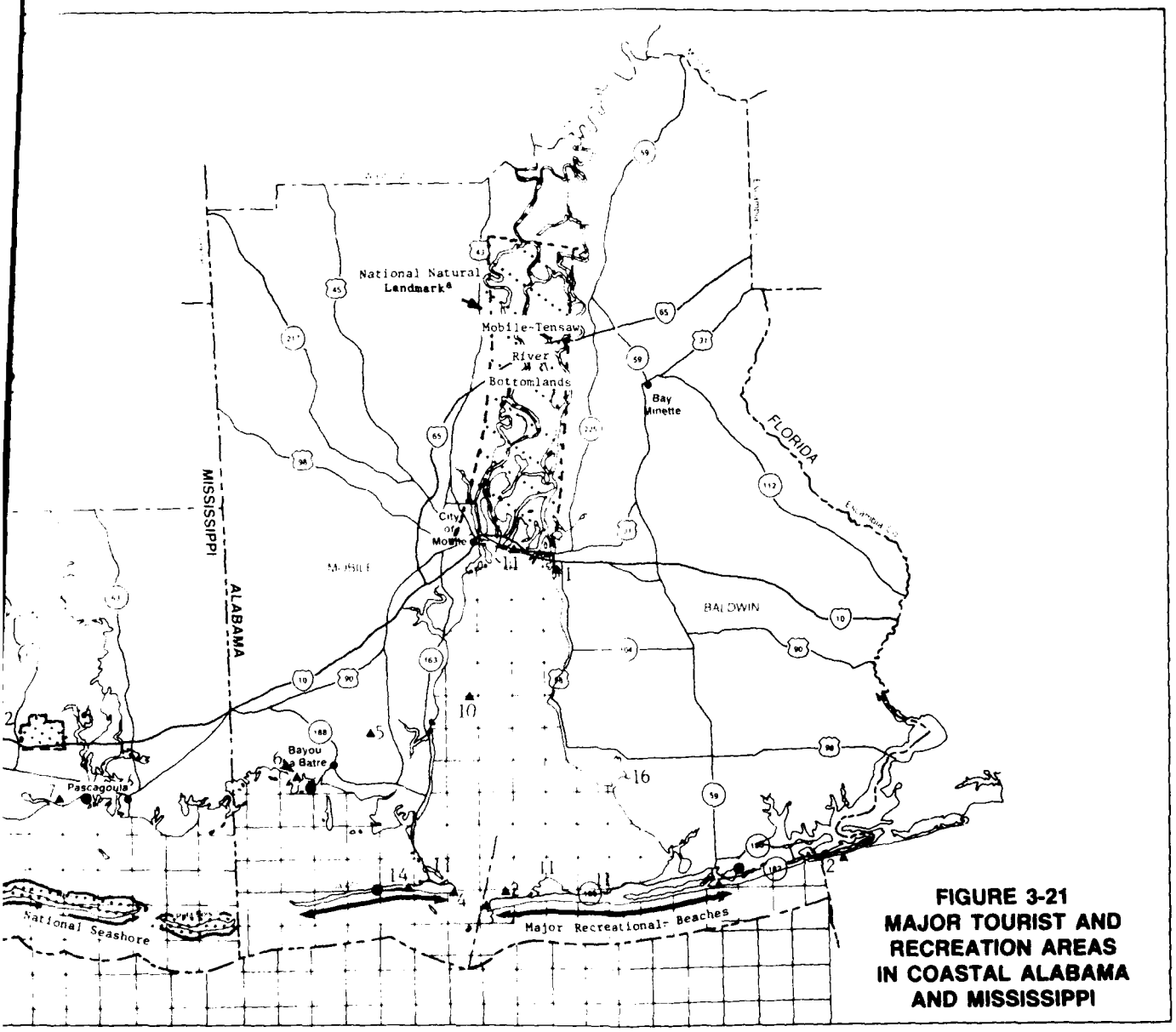


FIGURE 3-21
MAJOR TOURIST AND RECREATION AREAS IN COASTAL ALABAMA AND MISSISSIPPI

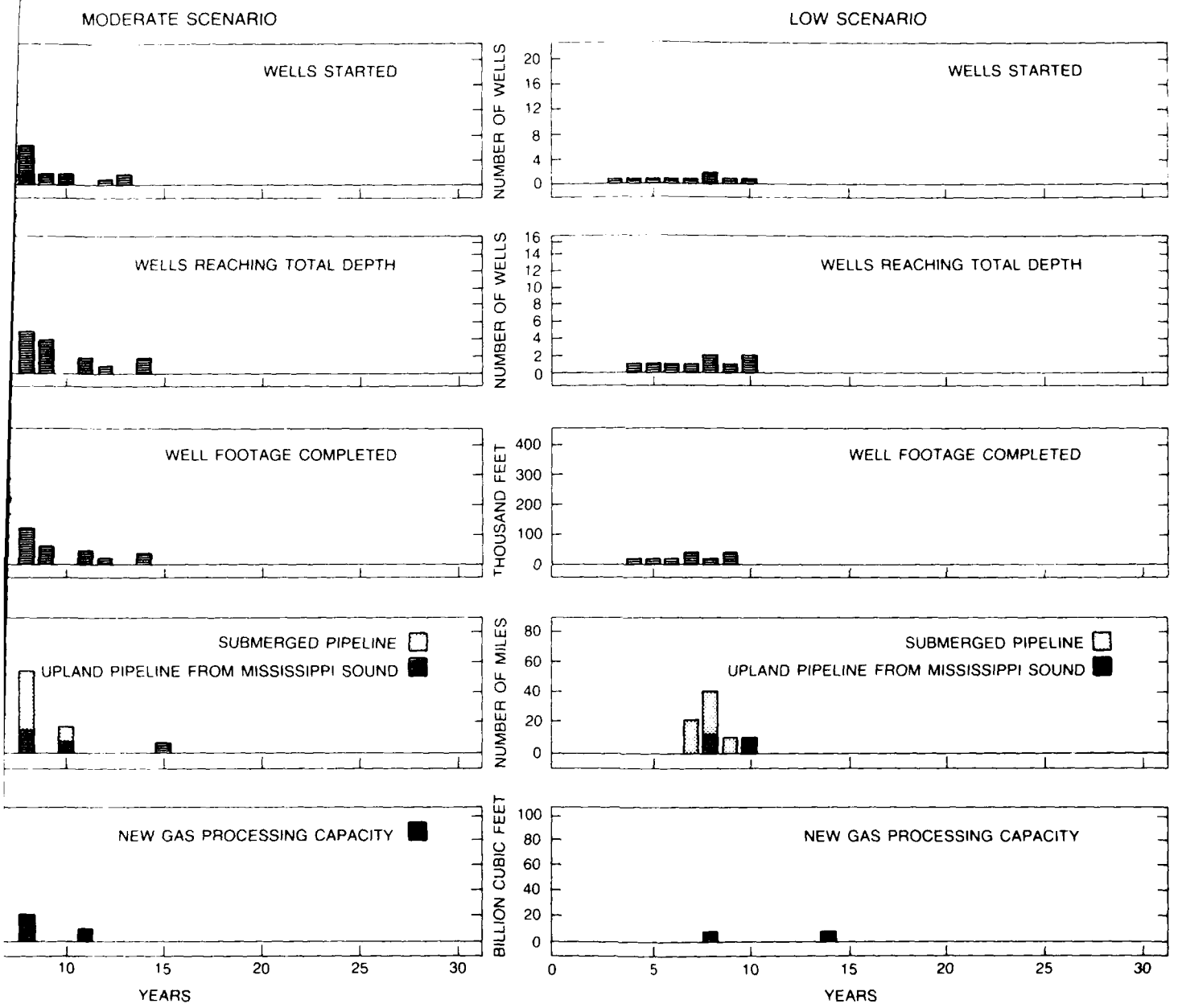
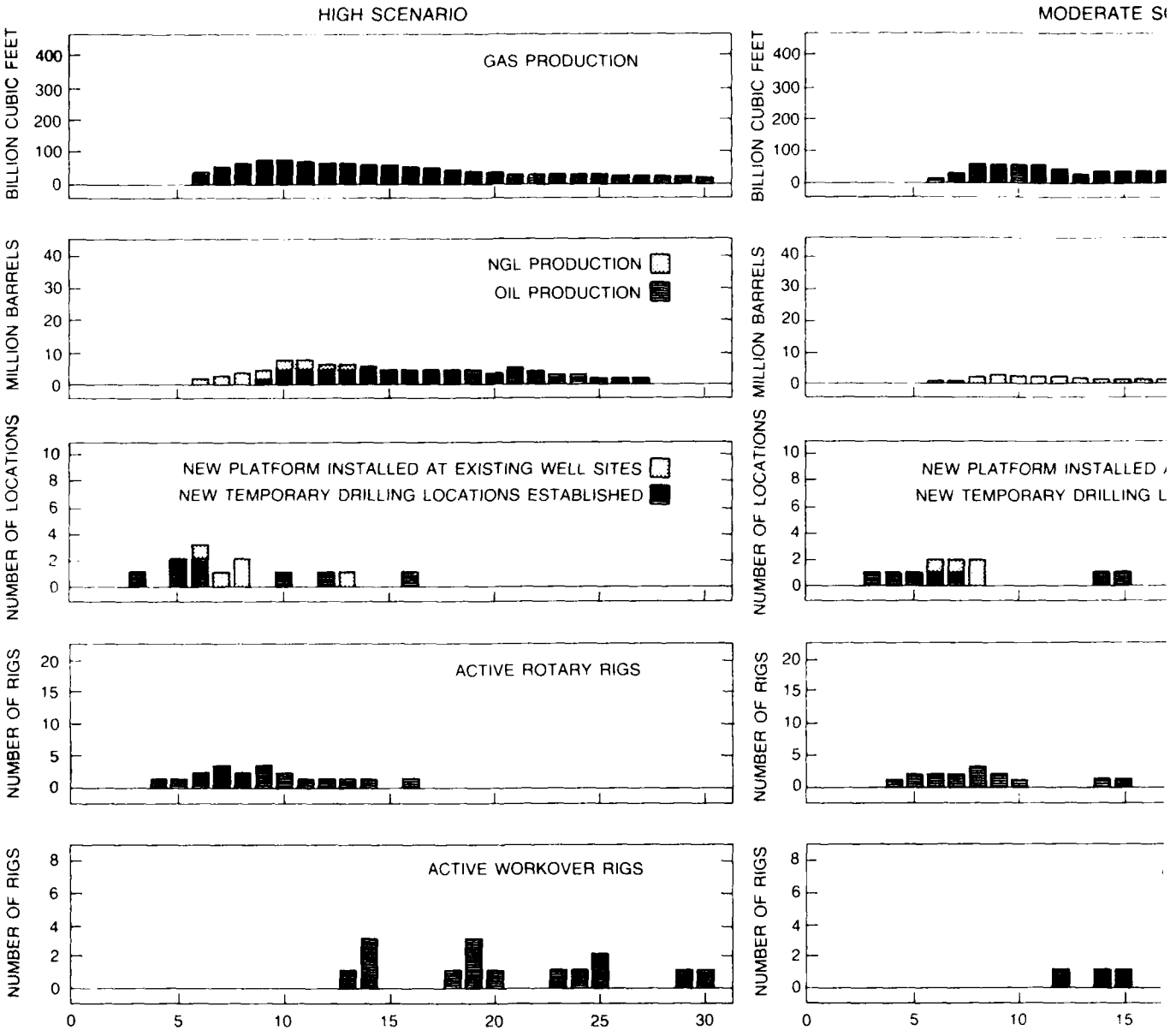


FIGURE 8-3
ACTIVITIES IN MISSISSIPPI SOUND RESULTING FROM THE HYDROCARBON RESOURCE DEVELOPMENT SCENARIOS (CONTINUED)


HIGH SCENARIO
MODERATE S
BILLION CUBIC FEET
GAS PRODUCTION
MILLION BARRELS
NGL PRODUCTION
OIL PRODUCTION
NUMBER OF LOCATIONS
NEW PLATFORM INSTALLED AT EXISTING WELL SITES
NEW TEMPORARY DRILLING LOCATIONS ESTABLISHED
NUMBER OF RIGS
ACTIVE ROTARY RIGS
ACTIVE WORKOVER RIGS

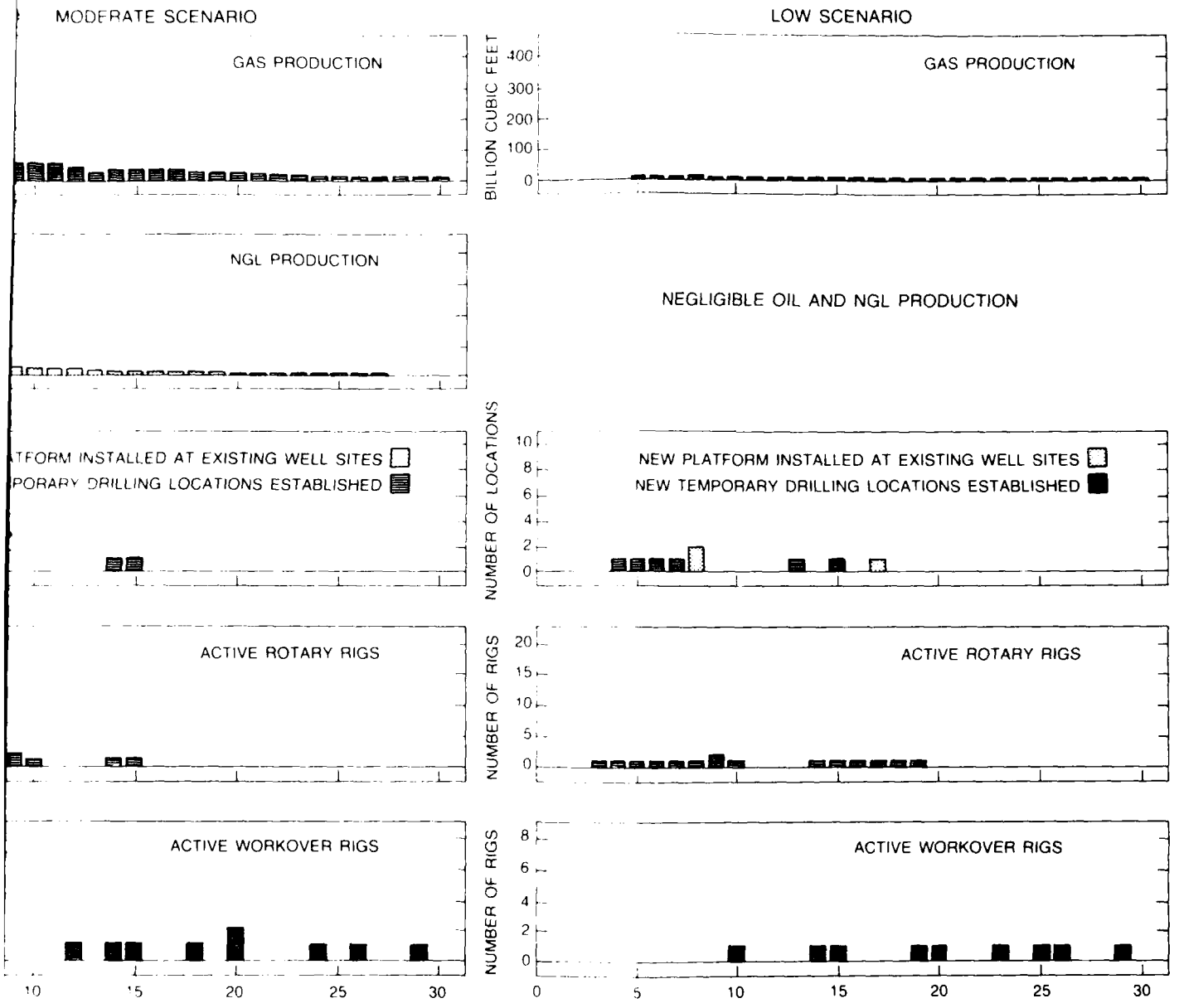
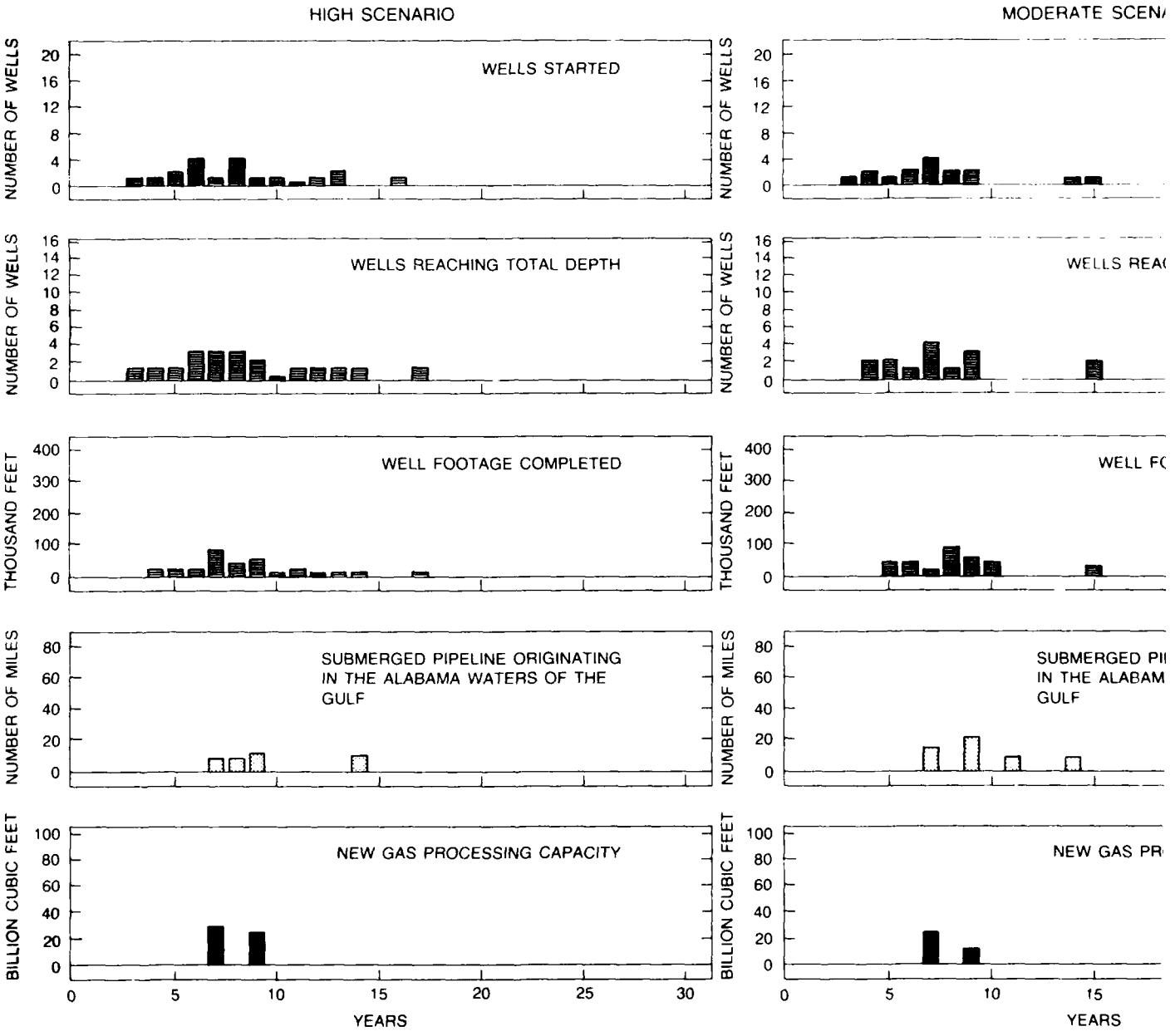


FIGURE 8-4
ACTIVITIES IN THE ALABAMA STATE WATERS OF THE GULF OF MEXICO RESULTING FROM THE HYDROCARBON RESOURCE DEVELOPMENT SCENARIOS


HIGH SCENARIO
MODERATE SCEN
WELLS STARTED
WELLS REACHING TOTAL DEPTH
WELL FOOTAGE COMPLETED
SUBMERGED PIPELINE ORIGINATING IN THE ALABAMA WATERS OF THE GULF
NEW GAS PROCESSING CAPACITY
NUMBER OF WELLS
THOUSAND FEET
NUMBER OF MILES
BILLION CUBIC FEET
YEARS

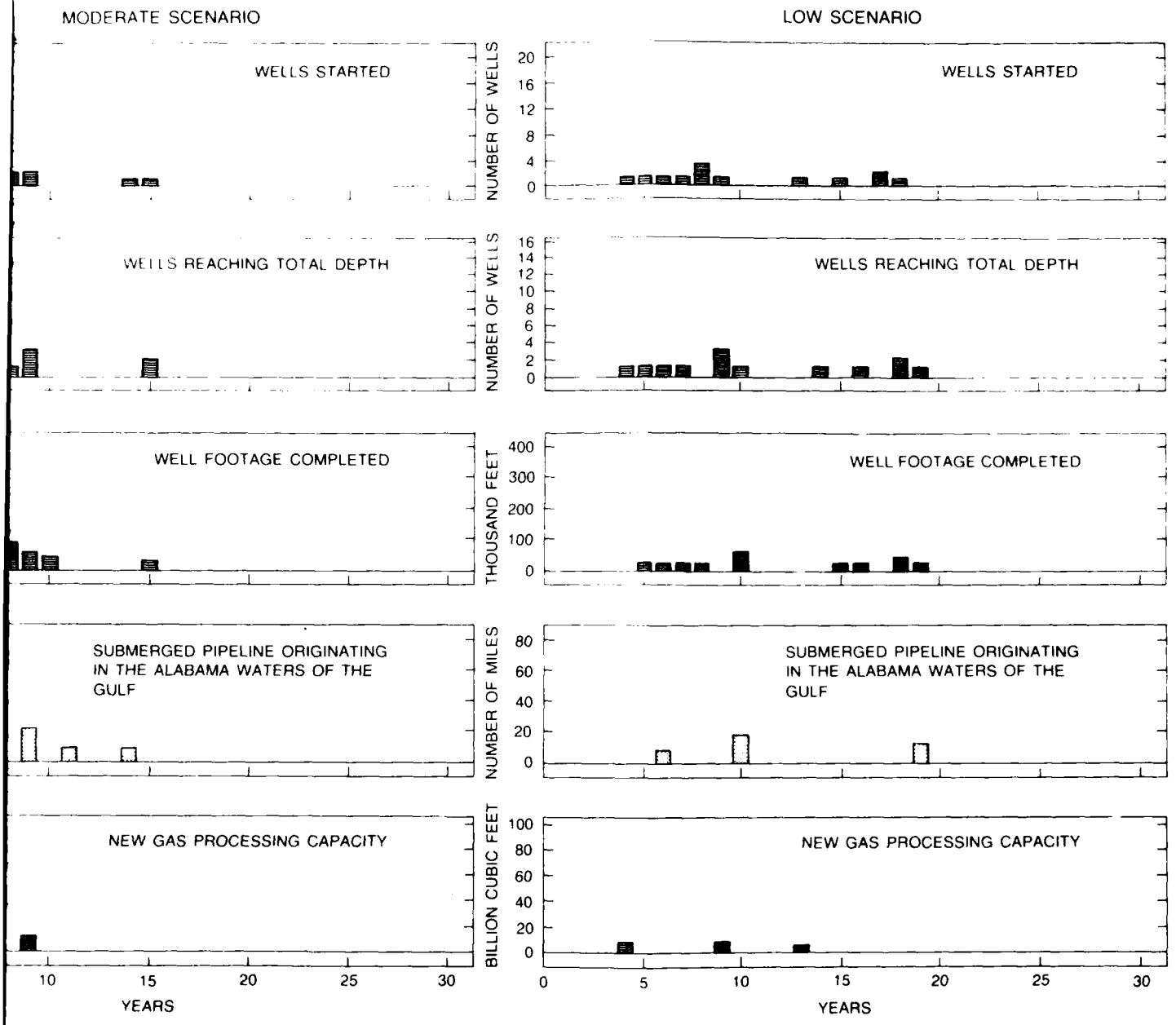
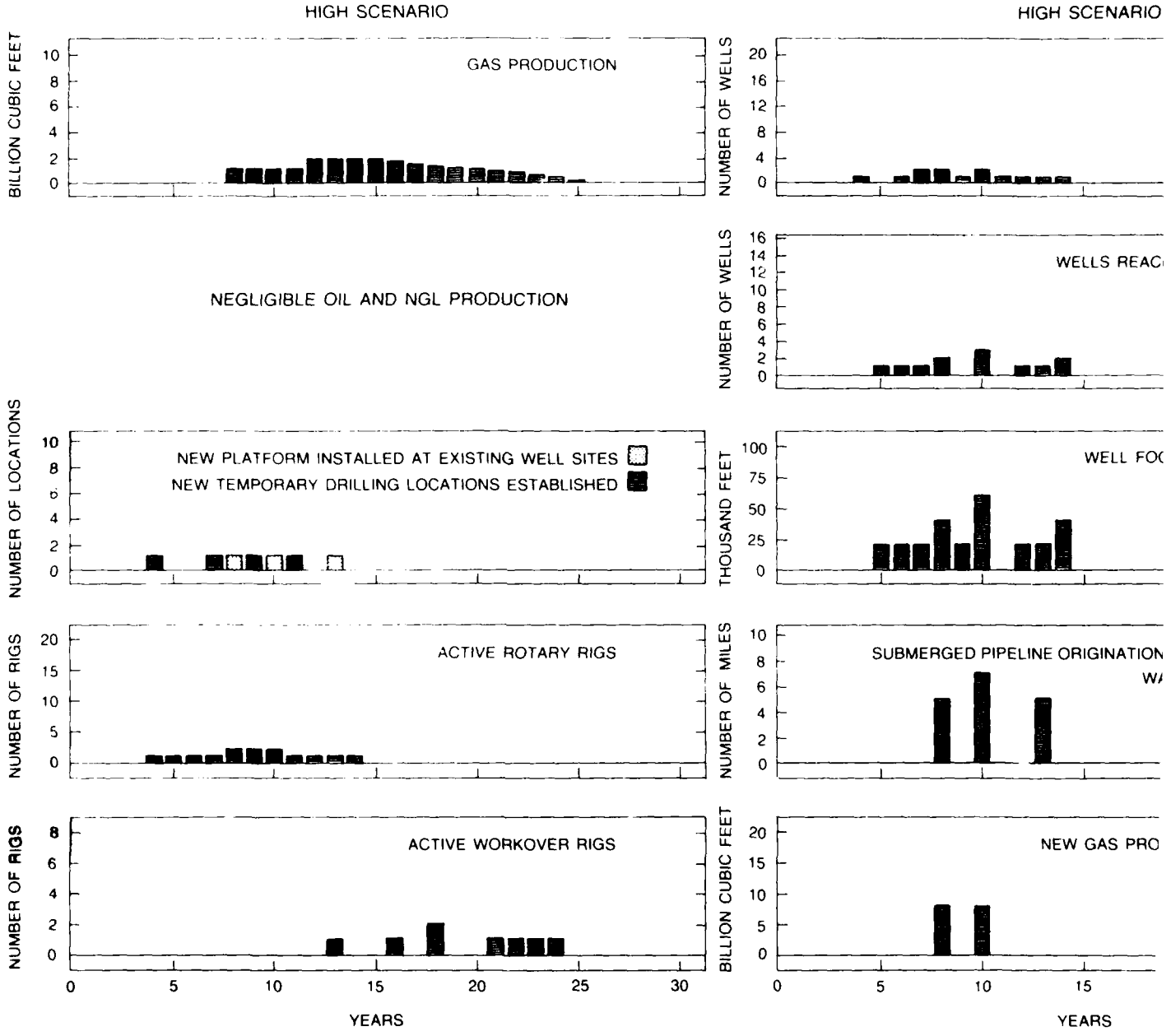
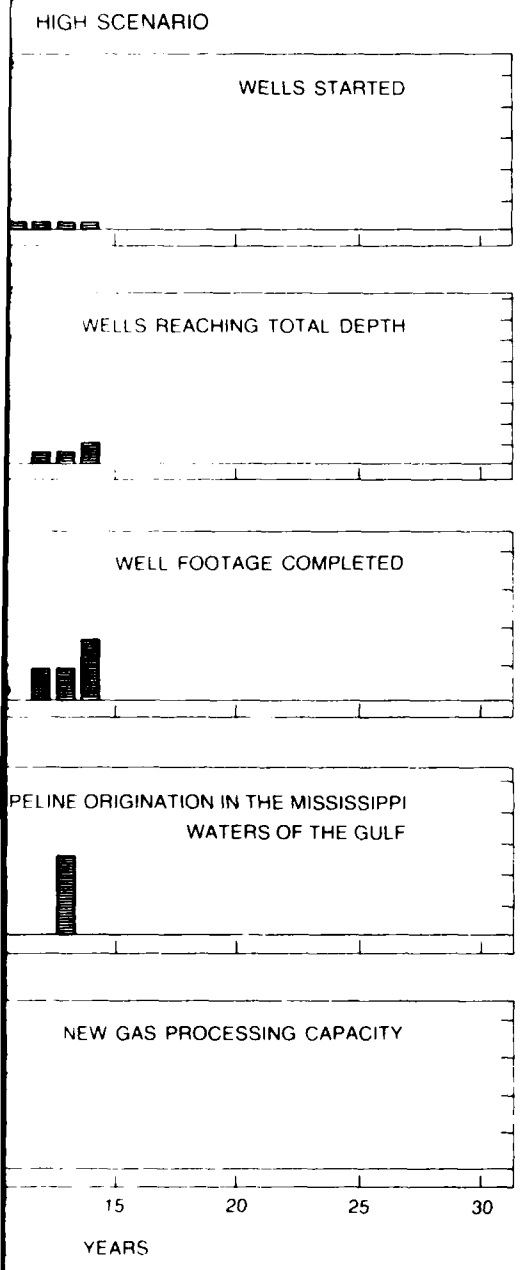


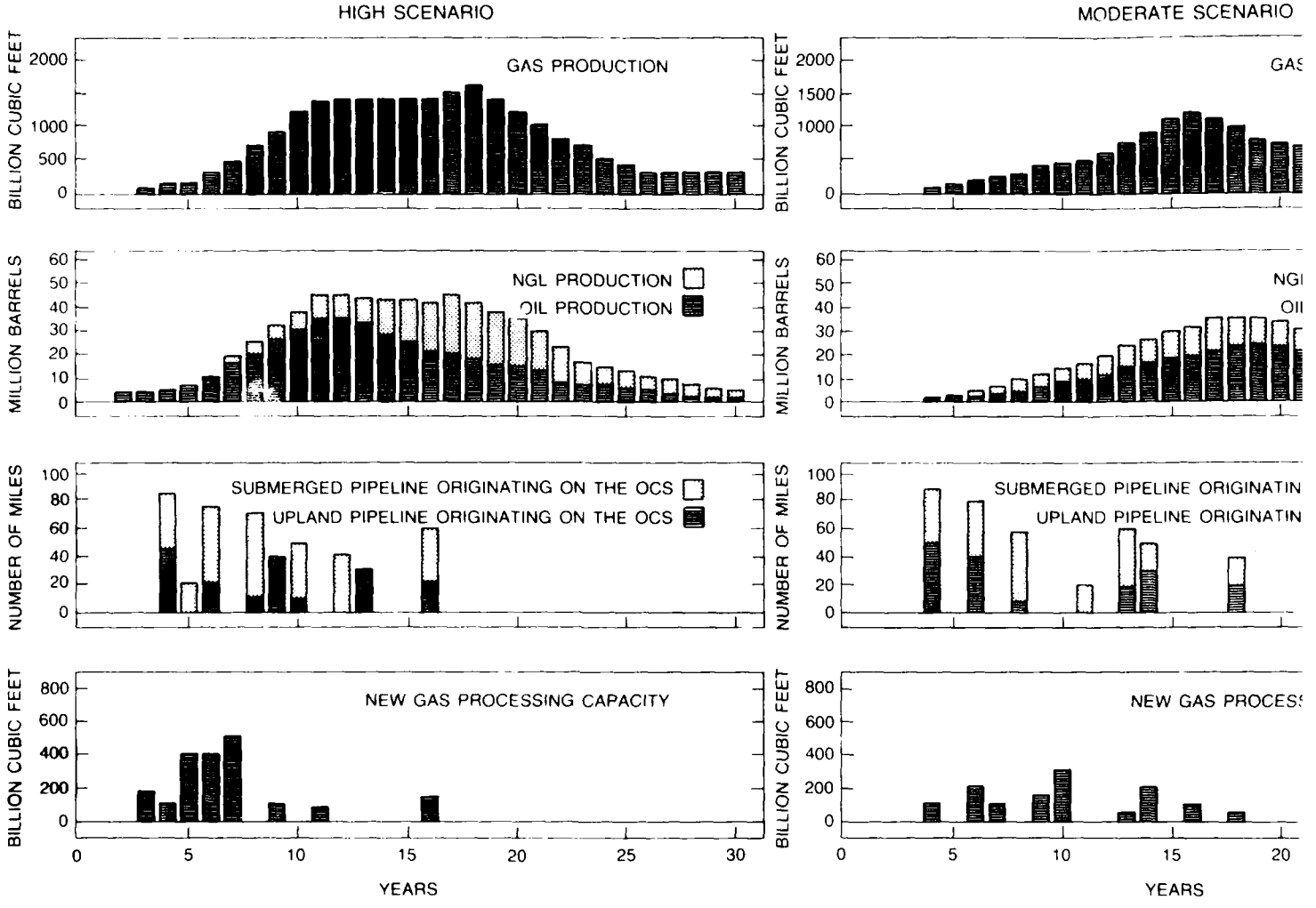
FIGURE 8-4
ACTIVITIES IN THE ALABAMA STATE WATERS OF THE GULF OF MEXICO RESULTING FROM THE HYDROCARBON RESOURCE DEVELOPMENT SCENARIOS (CONTINUED)


HIGH SCENARIO
HIGH SCENARIO
BILLION CUBIC FEET
GAS PRODUCTION
NUMBER OF WELLS
NEGLIGIBLE OIL AND NGL PRODUCTION
WELLS REAC
NUMBER OF LOCATIONS
NEW PLATFORM INSTALLED AT EXISTING WELL SITES
NEW TEMPORARY DRILLING LOCATIONS ESTABLISHED
THOUSAND FEET
WELL FOO
NUMBER OF RIGS
ACTIVE ROTARY RIGS
NUMBER OF MILES
SUBMERGED PIPELINE ORIGINATION
WA
NUMBER OF RIGS
ACTIVE WORKOVER RIGS
BILLION CUBIC FEET
NEW GAS PRO
YEARS
YEARS



NO ACTIVITY FOR MODERATE AND LOW SCENARIO

FIGURE 8-5
ACTIVITIES IN MISSISSIPPI STATE WATERS OF THE GULF OF MEXICO RESULTING FROM THE HYDROCARBON RESOURCE DEVELOPMENT SCENARIOS


HIGH SCENARIO
MODERATE SCENARIO
BILLION CUBIC FEET
GAS PRODUCTION
2000
1000
500
0
1500
MILLION BARRELS
NGL PRODUCTION
OIL PRODUCTION
60
50
40
30
20
10
NUMBER OF MILES
SUBMERGED PIPELINE ORIGINATING ON THE OCS
UPLAND PIPELINE ORIGINATING ON THE OCS
100
80
NEW GAS PROCESSING CAPACITY
800
600
400
200
0
5
10
15
20
25
30
YEARS

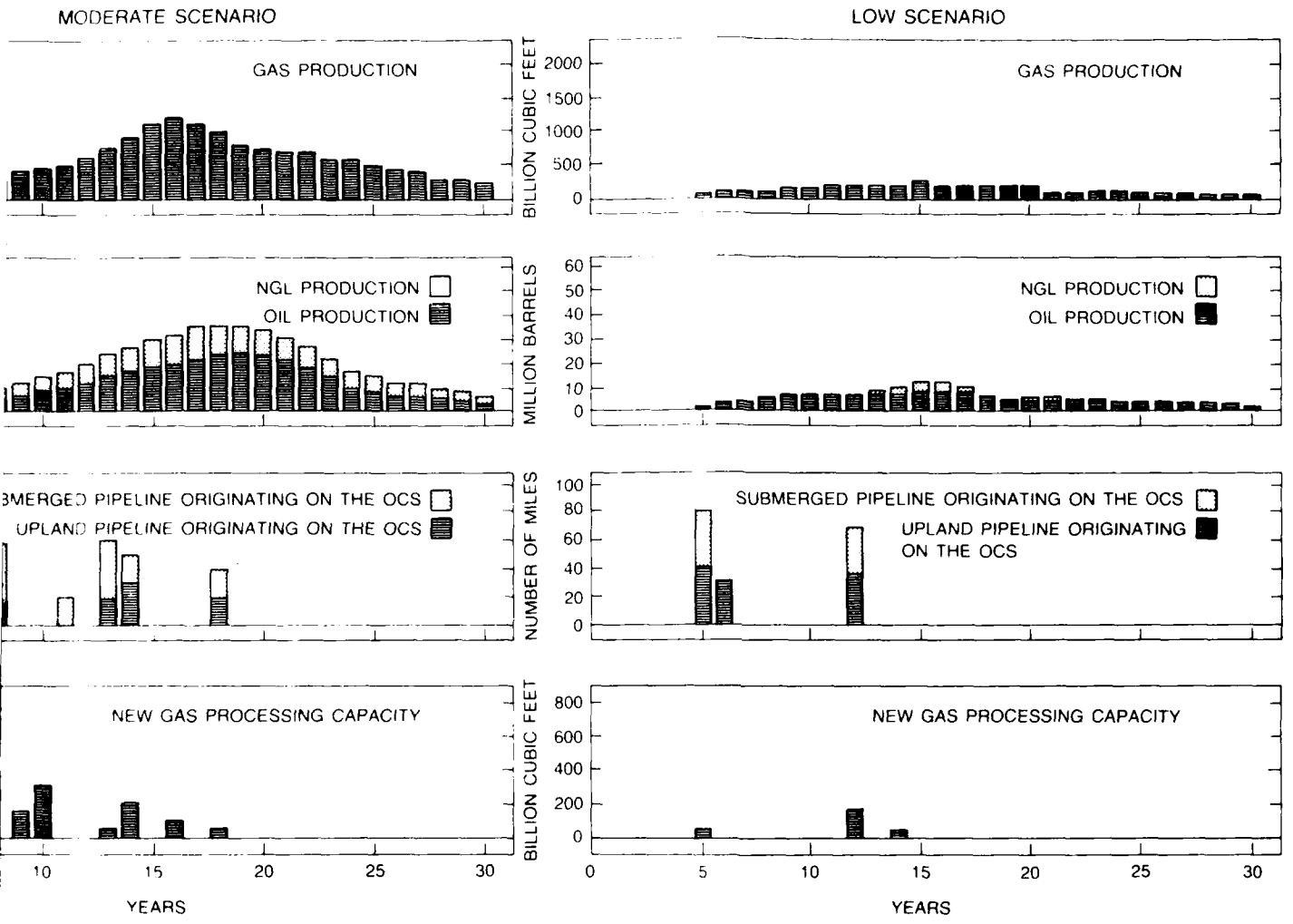
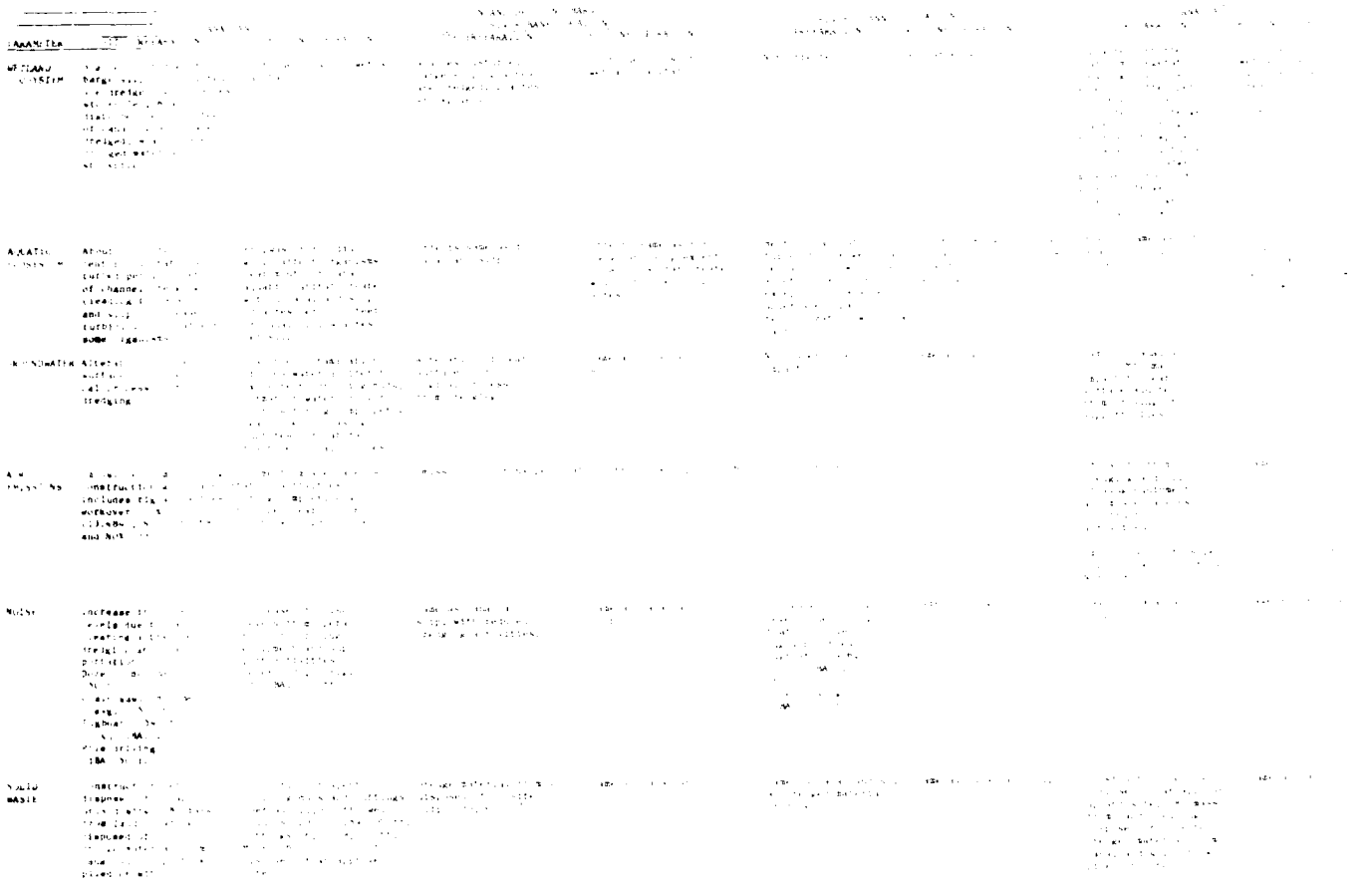


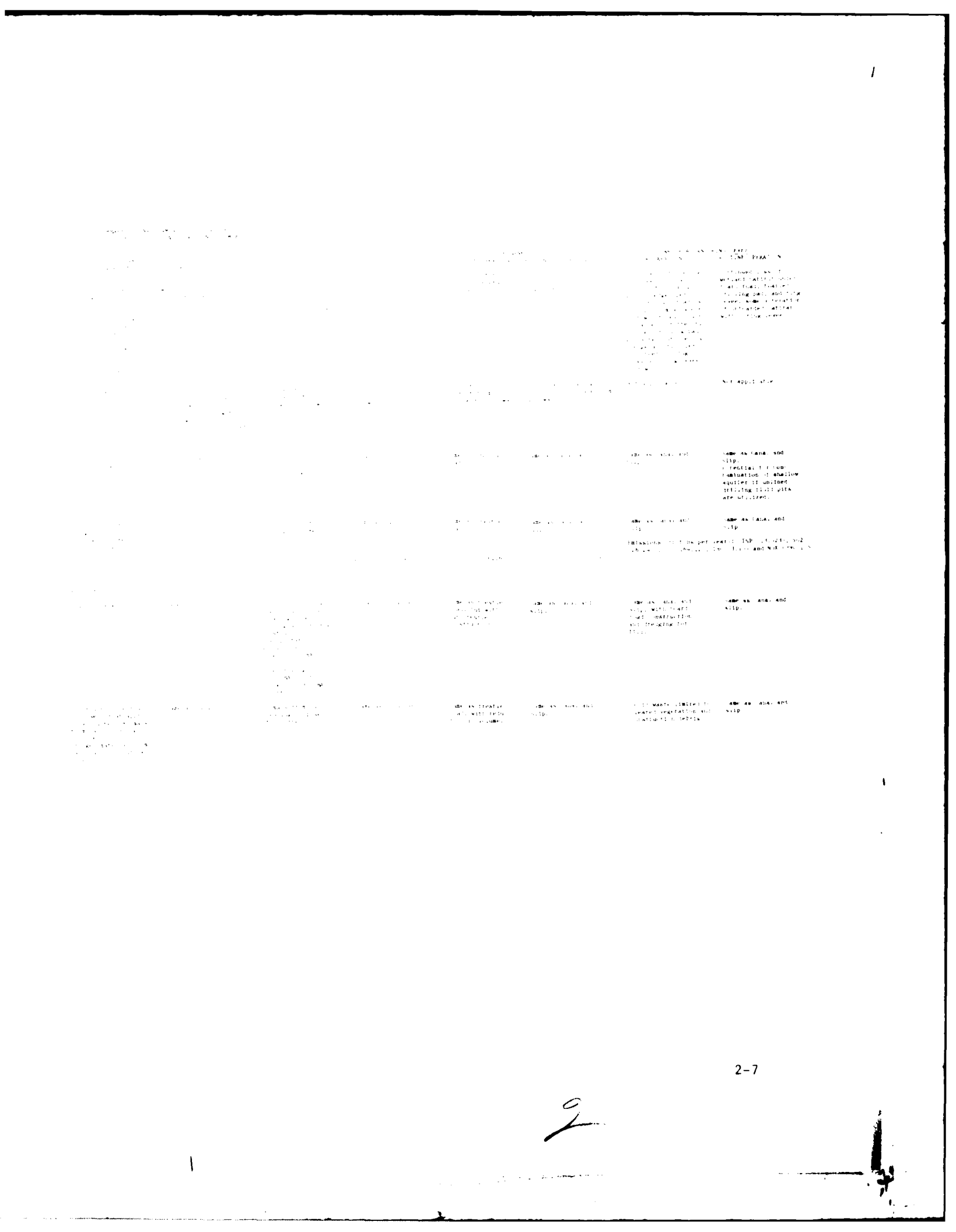
FIGURE 8-6
ACTIVITIES IN ADJACENT FEDERAL WATERS RESULTING FROM THE HYDROCARBON RESOURCE DEVELOPMENT SCENARIOS

TABLE 2-2

SUMMARY OF ENVIRONMENTAL LOADINGS AND GENERIC EFFECTS OF THE USE OF SWAMP BUGGIES FOR GEOPHYSICAL EXPLORATION IN THE MOBILE DELTA

Parameter	Effect
Surface Water Resources	Suspension of sediments along pull boat and/or marsh buggy paths. Short-term (less than 30 days) creation of shallow water channel less than 1 meter deep. Relatively small amounts of refined fuels spilled as a result of boat/buggy traffic and exploration activities.
Wetland Ecosystems	1 acre disturbed per mile of survey (no vegetation clearing); swamp buggy would push through brush and maneuver around trees.
Drilling Fluids	Simple compounds used in small amounts (1/2 gallon per 100 gallons of water).
Groundwater	Possible contamination of shallow alluvial aquifer from shotholes.
Noise	Temporary increase in noise levels from vehicles. Impacts will be more intense than offshore areas due to the sensitive receptor nature of the Delta area. Noise levels similar to trucks are expected: 72-95 dBA at 50 ft.
Solid Waste	Shothole cuttings and drill muds disposed as backfill in shothole. Less than 10 cubic feet of cuttings per 100 feet of shothole. Drill mud volumes include the volume of the hole and a small circulation tank.
Air Emissions	Emission of pollutants from swamp buggies and/or small boats. Emissions (in tons/year/vehicle): TSP (.036), SO2 (.072), CO (.610), HC (.101) and NOX (.043).
Socioeconomic Characteristics	26 to 32 people needed for a survey; half the crew could be unskilled local hires. Skilled workers would commute on weekly basis and reside in nearby motel. Minor traffic increase at meeting point; extensive local purchases of gas, food and minor equipment repairs.





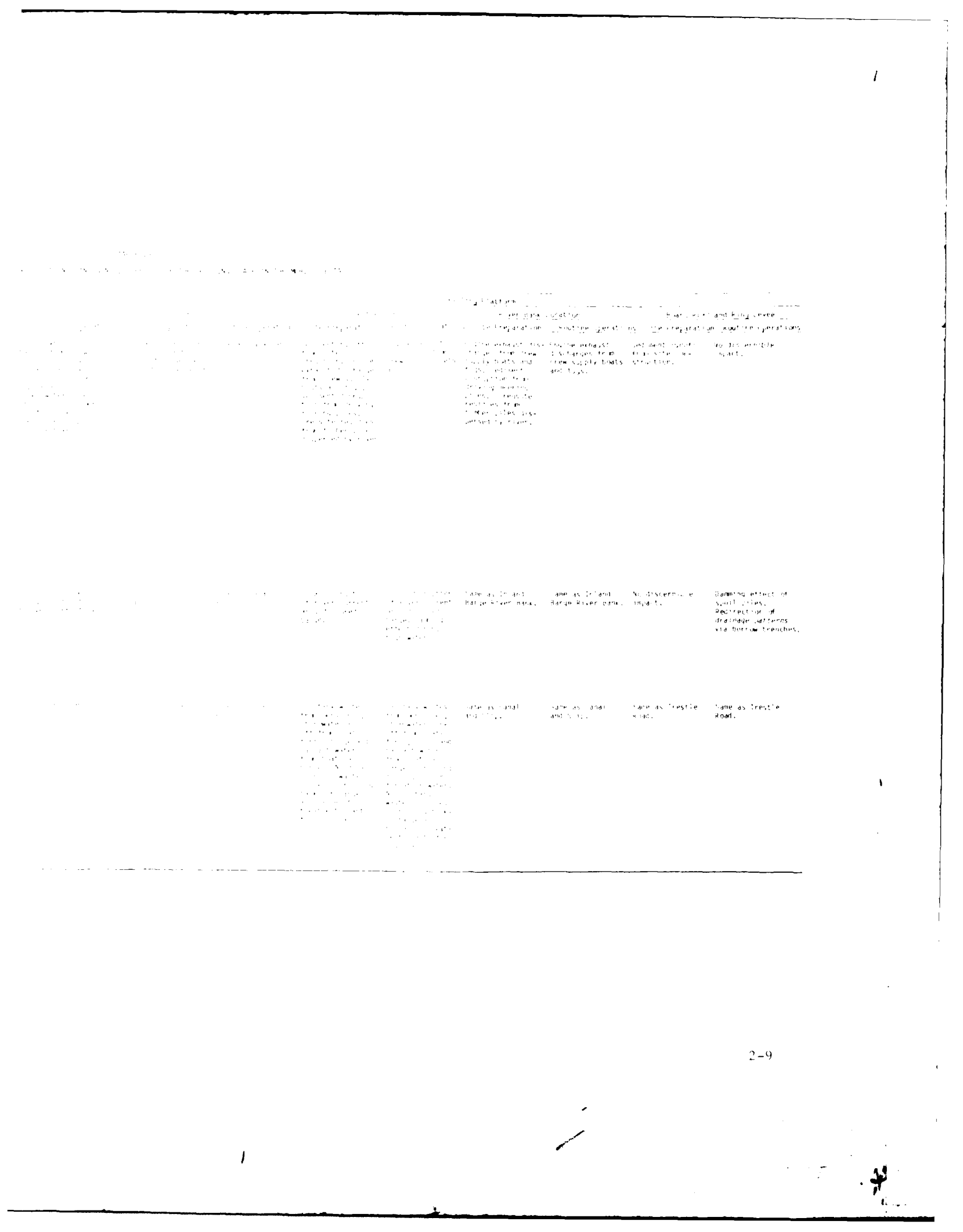


TABLE 2-9
SUMMARY OF ENVIRONMENTAL LOADINGS AND GENERIC EFFECTS OF PRODUCTION IN MOBILE BAY AND MISSISSIPPI SOUND

PARAMETER	WELL COMPLETION	PLATFORM CONSTRUCTION	GATHERING SYSTEM CONSTRUCTION		BARG
			ESTUARINE ECOSYSTEM	WETLAND ECOSYSTEM	
WATER QUALITY	Sediment resuspension and engine exhaust discharges from crew/supply boats and tugs. Resuspension of sediments from construction related activities.	Sediment disruption during construction of platform. Creosote residue from timber piles. Engine exhaust discharges from crew/supply boats and tugs.	In estuarine ecosystems, sediment resuspension from dredging. Release of nutrients and oxygen demand from sediments. Local changes in bottom water salinity. In wetland ecosystems sediment movement resulting in some leaching of nutrients, metals and humic materials.	Sediment resuspension and engine exhaust discharges from crew/supply boats and tugs.	Sedim... dredg... drill... Engi... from ... ... drill... for ...
HYDROLOGY	Local obstruction of currents by barge/boat.	Local obstruction of current by barge/boat.	In estuarine ecosystems, local obstruction of current by barge/boat. Local changes in bottom water circulation.	Channelization of water through pipeline trenches would occur.	Local ... curre...
WETLAND ECOSYSTEM	Continued loss of wetland habitat.	Continued loss of wetland habitat (no additional area disturbed).	Not applicable.	About 1 acre disturbed per 1000 feet of gathering system (1/3 acre for dredged trench, 2/3 acre for work area and dredged material stock pile).	Same ... term ... cove... eli... use...
AQUATIC ECOSYSTEM	Continued effects as for drilling if drilling rig used; localized turbidity increase if smaller rig brought in to replace drilling rig.	Effects the same as for drilling platform.	Loss of 4 1/2 acres of benthic habitat per 1000 feet of pipeline during construction; turbidity effects to benthic communities adjacent to dredging area.	Not applicable.	Short ... of ... tren... effe... and ... met...
WASTE WATER DISPOSAL	Sanitary wastes from personnel, stormwater runoff from platforms, bilge and ballast water from boats and barges. No discharge; waste is stored on barges and hauled to treatment plants for disposal.	Same as Well Completion.	Same as Well Completion.	Same as Well Completion.	No ... vesse... by ... vesse...
GROUNDWATER	Possible aquifer contamination from formation additives due to unintentional fracturing of and subsequent communication through aquicludes. Potential for introduction of hydrocarbon and formation waters and additives by casing ruptures during fracturing.	Not applicable.	No discernible impact.	Possible contamination of shallow aquifer due to pipeline failure.	No ... fres... wate... Soil...

TABLE 2-8 (continued)
ENVIRONMENTAL LOADING AND GENERIC EFFECTS OF
OFFSHORE MOBILE BAY AND MISSISSIPPI SOUND

	JACKUP AND SUBMERSIBLE DRILLING RIG		FIXED PLATFORM	
	SITE PREPARATION	ROUTINE OPERATION	CONSTRUCTION	OPERATION
	No discernible impact.	Same as Bay/Sound.	No discernible impact.	Same as Bay/Sound
	Up to 12 people needed to bore soil. 4-10 jobs to drive pile for mooring. Extra tug contracted, 2-4 in crew. Rigging up involves typical drilling complement of 20 to 36 people.	Same as inland drilling	Existing regional facilities could be used to construct platform modules. 50-80 people needed to install structure offshore; only a few positions filled by locals. Tugs could be local, 2-8 people needed. 1 month to install a platform.	Same as mobile rig.
	Increased water traffic (pile driver barge, supply barge, crew boat); estimated maximum increase: 3 trips per day (1 barge, 2 crew boats); 200 to 250 foot square work area closed to navigation.	Increased waterway traffic same as for barge in open water; continued closure of drilling area to navigation.	Increased water traffic same as for barge in open water; continued closure of drilling area to naviation.	Same as construction.

TABLE 2-8 (continued)
SUMMARY OF ENVIRONMENTAL LOADING AND EFFECTS
DRILLING, MOBILE BAY AND MISSISSIPPI

	INLAND DRILLING BARGE				
	MOBILE BAY AND MISSISSIPPI SOUND		SALT MARSH		
PARAMETER	SITE PREPARATION	ROUTINE OPERATION	SITE PREPARATION	ROUTINE OPERATION	
SOLID WASTE	No discernible impact.	Production of spent drilling muds and cuttings per av. 21,000 ft. well. Liquids: 23,500-184,000 bbl. Cuttings: 6,000-9,000 bbl. Muds: 6,000-17,000 bbl. Disposed of at an approved site.	No discernible impact.	Same as Bay/Sound.	
SOCIOECONOMIC CHARACTERISTICS	As many as 12 people in soil boring crew; company can be local or regional. Nearby firm could be used for foundation and pile driving, 4-10 are needed to drive piles. Locally based employees circulate wages in adjacent area.	Self-contained operation, 20-36 people on board 24 hours a day; little if any interaction with adjacent economy. Equipment and supplies transported directly from source or shuttled through staging dock; adequate ports available in Mississippi and Alabama.	Employment for 8-10 to dredge area, and prepare foundation; 4-10 needed to drive piles for keyway. Local businesses could be used. Effects are same in Bay or Sound.	Same as inland drilling barge.	
NAVIGATION	Increased waterway traffic (pile driver barge, supply barges, crew boats); estimated maximum increase: 6 trips per day (3 barges, 3 crew boats); 300 to 400 foot square work area closed to navigation.	Increased waterway traffic (mud and supply barges, crew boats); estimated maximum increase: 5 trips per day (1 supply barge, 1 waste barge, 3 crew boats); continued closure of drilling area.	Increased waterway traffic similar to barge in open water; dredged material pile next to dredged channel leading to access canal could prevent waterway traffic from crossing this area.	Increased waterway traffic same as for barge in open water; continued impact from channel dredged material pile.	

[1]No discharges are allowed from platforms or drilling barges with the exception of uncontaminated bilge and ballast water; discharges from marine vessels are allowed in conformance with U.S. Coast Guard regulations.

TABLE 2-8

SUMMARY OF ENVIRONMENTAL LOADING AND GENERIC EFFECTS OF DRILLING MOBILE BAY AND MISSISSIPPI SOUND

[illegible]	JACK-UP AND SUBMERSIBLE SITE PREPARATION	DRILLING RIG ROUTINE OPERATION	CONSTRUCTION	FIXED PLATFORM OPERATION
[illegible]	Sediment disruption by legs of jackup rig, pile driving; creosote residue from timber piles. Engine exhaust discharges from crewsupply boats and tugs.	Same as Bay/Sound.	Sediment disruption during construction of platform; creosote residue from timber piles. Engine exhaust discharges from crew supply boats and tugs.	Same as Bay/Sound.
[illegible]	Local disturbance of currents around barges and boats. Increase in water velocities due to canal-open water connection.	Local distruance of currents around rig and service craft.	Same as Jack-up.	Same as Jack-up.
[illegible] loss of wetland [illegible]	Not applicable.	Not applicable.	Not applicable.	Not applicable.
[illegible]	Loss of 0.2 acres of habitat under jackup legs, 0.4 to 0.7 acres under hull of submersible, fouling community habitat created on underwater portions of both rigs, localized turbidity during rig placement.	Continued loss of benthic habitat.	Minimal additional benthic area disturbed by platform legs, extremely localized, short-term turbidity increase during platform emplacement; fouling community habitat created on legs of platform.	Continued loss of benthic habitat for drilling period.
[illegible]	Same as Bay/Sound.	Same as Bay/Sound.	Same as Bay/Sound.	Same as Bay/Sound.
[illegible]	Not applicable.	Same as Bay/Sound.	No discernible impact.	Same as Bay/Sound.
[illegible]	Emissions from drill rig and support vehicles. [illegible] rig activity during completion and workover. Emissions (in tons per year): [illegible] (2.95), and NOX (390.75).			
[illegible]	Noise level increase due to marine traffic and possible transport by helicopter, barge tug, [illegible] dBA [illegible] ft, tug alone: [illegible] dBA [illegible] ft. Motorboat: 80 dBA (avg. [illegible] ft. Helicopter: [illegible] dBA, [illegible] ft.	Same as Bay/Sound.	Same as Jack-up.	Same as Bay/Sound.

TABLE 2-6
SUMMARY OF ENVIRONMENTAL LOADING AND GENERIC EFFECTS OF DRILLING MOBILE BAY AND MISSISSIPPI SOUND.

PARAMETER	MOBILE BAY AND MISSISSIPPI SOUND		INLAND DRILLING BARGE		JACKUP AND SEMISUBMERSIBLE RIGS	
	SITE PREPARATION	DRILLING OPERATION	SITE PREPARATION	DRILLING OPERATION	SITE PREPARATION	DRILLING OPERATION
WATER QUALITY	Circulation, salinity and sediment disruption from pile and sheet driving and access dredging. Possible release of nutrients and oxygen-demanding substances from dredged sediments. Resuspension of sediments during shell pad placement. Creosote residue from timber piles. Sediment resuspension and engine exhaust discharges from crew/supply boats and tugs.	Sediment resuspension and engine exhaust discharges from crew/supply boats and tugs.	Same as Bay/Sound.	Same as Bay/Sound.	Sediment disruption by legs & jackup; pile driving, creosote residue from timber piles, engine exhaust discharges from crew/supply boats and tugs.	Same as
HYDROLOGY	Small amounts of local disturbance of currents around barges, boats and dredged areas.	Local disturbance of currents around barges and dredged areas.	Local disturbance of currents around access dredging during slight tide submergence of salt marsh. Increase in water velocities due to canal-open water connection.	Local disturbance of currents during slight tide submergence of salt marsh. Increase in water velocities due to canal-open water connection.	Local disturbance of currents around barges and boats. Increase in water velocities due to canal-open water connection.	Same as
WETLAND ECOSYSTEM	Not applicable.	Not applicable.	Same as for canal and slip, in Delta: 5 acres disturbed for barge slip, 5-6 acres disturbed per 1000 feet of canal.	Continued loss of wetland habitat.	Not applicable.	Same as
AQUATIC ECOSYSTEM	Loss of 0.3 to 0.7 acres of benthic habitat (buried under shell pad); fouling community habitat created on sheet steel (0.5 acres.); turbidity generated in placement of shell pad and by vessel propwash.	Continued loss of benthic habitat for drilling period; localized increase in turbidity.	Benthic habitat lost in dredged channel for salt marsh access: 3 acres lost per 1000 feet of channel (1 1/2 acres for channel, 1 1/2 acres for dredged material storage). Turbidity from channel dredging could affect oyster populations.	Dredged channel and acres of dredged material would recolonize but benthic community could be different. Oyster reefs under sediment layer would not be reestablished.	Loss of 0.2 acres of habitat under jackup legs, 0.4 to 0.7 acres under hull of submersible, fouling community habitat created on underwater portions of both rigs; localized turbidity during rig placement.	Same as
WASTE WATER DISPOSAL	Sanitary wastes from personnel, stormwater runoff from platforms, bilge and ballast water from boats and barges. No discharge;(1) waste is stored on barges and hauled to treatment plants for disposal.	Sanitary wastes from personnel, stormwater runoff from platforms, bilge and ballast water from boats and barges, drilling muds, liquids and formation water. No discharge;(1) waste is stored on barges and hauled to treatment plants for disposal.	Same as Bay/Sound.	Same as Bay/Sound.	Same as Bay/Sound.	Same as
GROUNDWATER	Not applicable.	Possible contamination of freshwater aquifer by exposure to drilling muds, formation waters or hydrocarbons through improperly sealed wells, casing ruptures, or natural fractures in aquifudes.	Not applicable.	Same as Bay/Sound.	Not applicable.	Same as
AIR EMISSIONS	Emissions from dredge, pile driver, drill rig, and support vehicles. Includes rig activity during completion and workover. Emissions (in tons per year): TSP (13,47), SO2 (26,14), CO (164,21), HC (5,0), and NOX (390,1).				Emissions from drill rig and su... Emissions (in tons per year: ...	
NOISE	Noise levels increase due to pile driver and increased marine traffic. Tugboat: 84-92 dBA (50 ft, 300 ft. Pile driving: 101 dBA, ft.	Increase in noise levels from operation of drilling equipment and support activities. Generic drill rig: 85 dBA, 100 ft.	Same as Bay/Sound but with dredging noise added.	Same as Bay/Sound. Noise levels more noticeable near sensitive receptor shorelines.	Noise level increase due to marine traffic and possible transport by helicopter, barge tug, loaded: 84-93 dBA (50, 100 ft, tug alone: 87 dBA (50, 100 ft. Motorboat: 80 dBA (avg, 50 ft. Helicopter: 74-91 dBA, 1000 ft.	Same as

TABLE 2-7

SUMMARY OF ENVIRONMENTAL LOADINGS AND GENERIC EFFECTS OF GEOPHYSICAL SURVEYS IN MOBILE BAY AND MISSISSIPI SOUND

Parameter	Seismic Survey Boats in Bay and Sound	Marsh Buggies in Salt Marsh
Surface Water Resources	Very short-term (less than 1 hour) turbulence due to boat wake and possibly due to explosion activity. Relatively small amounts of refined fuels and oils spilled as a result of boat traffic and exploration activities.	Suspension of sediments along marsh buggy path. Short-term (less than 30 days) creation of shallow water channel less that 1 meter deep. Relatively small amounts of refined fuels spilled as a result of marsh buggy traffic and exploration activities.
Aquatic Ecosystems	Potential minor effect from survey boat and air gun operations.	Not applicable.
Wetland Ecosystems	Not applicable.	1 acre disturbed per mile of survey line. Vegetation crushed. Excessive rutting could alter water flow patterns. Soil compaction could hinder vegetation recovery.
Drilling Fluids	Not applicable.	Simple compounds used in small amounts (1/2 gallon per 100 gallons of water).
Wastewater Disposal	Sanitary wastes (10 to 40 gallons per person per day) and other boat or buggy wastes would also be discharged in the study area in conformance with U.S. Coast Guard regulations.	
Groundwater	Not applicable.	Possible contamination of shallow aquifer from shot holes.
Air Emissions	Emissions from survey vehicles. Emissions (in tons per year): TSP (0.7), SO2 (.14) CO (1.21), HC (.20) and NOX (.10).	
Noise	No discernible impact. Noise levels similar to ambient marine traffic.	Temporary increase in noise levels from survey vehicles. Noise will be more noticeable in sensitive receptor shore-line areas. Noise levels similar to trucks are expected: 72-95 dBA, 50 ft.
Solid Waste	Shothole cuttings and mud disposed as backfill in shothole. Less than 10 cubic feet of cuttings per hole. Drill mud volumes include the volume of the hole plus a small circulation tank.	Shothole cuttings and drill muds disposed as backfill in shothole. Less than 10 cubic feet of cuttings per 100 feet of shothole. Drill muds volumes include the volume of the hole of a small circulation tank.
Socioeconomic Characteristics	15-16 member crew on 2 boats for a 14-day tour, 2-3 could be local hires. Intermittent interaction with shore to purchase supplies, fuel or dock between contracts.	Employment for 5-7 technical surveyors, 9 operators of 3 shot hole rigs, and several unskilled laborers. Laborers could reside in the adjacent area. Purchases of gas, food and minor repairs could be made in adjoining communities.
Navigation	Potential impact from survey boat towing mile-long survey cable.	Not applicable.

TABLE 2-6

SUMMARY OF THE EFFECTS OF SPILLS OF MATERIAL OR RELEASE TO THE ATMOSPHERE OF NATURAL GAS CONTAINING H_2S IN THE MOBILE DELTA

ACCIDENT	EFFECT
	-DRILLING-
Spills Crude Oil	Direct toxic effect on organisms downstream if spill is large and uncontained. In southern Delta, waterfowl could be greatly affected if present in large numbers. Aromatic fraction would be diluted and evaporated. Much of saturated fraction carried to sediments. Persistence of oil in sediments for many years is possible, especially in floodplain area. Sublethal effects on productivity and sediment organisms could last several years where oil concentrations were great enough.
Fuel Oil	75,000 to 100,000 gallons in drilling barge storage tanks. 40,000 gallons in fuel transport barges. Effect of spill would be similar to crude oil spill.
Chemicals	Volumes spilled would be small. Effects, if any, would be localized because of dilution.
Drilling Muds	Most material would sink to bottom at site of spill. Turbid plume of small quantity of fine material would extend away from site. Effect would be localized. Material slowly diluted in channel by bedload transport. Spill in canal would be buried when canal restored. Some localized contamination of groundwater could occur.
Natural Gas Containing H_2S	Most gas would bubble to surface. Hydrogen sulfide dissolved would be oxidized and diluted in water column. Could be some effect in confined canal.
Atmospheric Release of Gas Containing H_2S	H_2S is heavier than air, but normally it is released under pressure and mixed with methane which is lighter than air. Initially, there would be some vertical distribution of the H_2S because of mixing with methane. Most regulatory agencies require that the applicant show a "fail-safe" or emergency planning analysis which would preclude major hazards to the public or flora and fauna. Generally, the belief is that concentrations greater than *10.0* ppm over an 8 hour day should be avoided. There are basically two types of accidents; pipeline rupture and well blowouts. Studies of various size, pressure and duration pipeline ruptures indicate up to 11 million cubic feet of H_2S gas may be released. Under these conditions, concentrations between 117 and 154 ppm have been calculated at distances equal to or less than 200 meters from the break. Well blowouts are more likely to occur where they affect oil company personnel. In general, procedures for minimizing the likelihood of such an event have been well documented and safety training is an integral part of oil rig personnel. Again, here concentrations usually are less than 100 ppm relatively close to the source. The hazard associated with either of these two types of accidents is dependent upon the distance between the location of the accident and the prevailing wind at the time of the accident-regardless of the geographical area.
Socioeconomic Characteristics	An accident could affect use of waterbody by hunters, boaters and fishermen. $4.9 million annually spent in Delta area for tackle, food, lodging and bait. Waterfowl hunting could be effected depending on time of the year of the accident.
	-PRODUCTION-
Spills Well Servicing	Solvents and materials used in small volumes. Effects, if any, would be very localized.
Pipeline Rupture	Crude oil released in wetland at low water would kill vegetation in area affected by pooled oil. Oil released to water would have effects described for spill during drilling.
Well Workover	Activity is like drilling phase. Spills would be similar to those described for drilling.
Enhanced Recovery	Materials such as water, steam and CO_2 would have negligible effects if released. Other chemicals that might be used could have some effect depending on circumstance of spill.
Pipeline Rupture Releasing Natural Gas Containing H_2S	Same as drilling.
Socioeconomic Characteristics	Same as drilling.

TABLE 2-5

EFFECTS OF WELL FIELD ABANDONMENT IN THE MOBILE DELTA

Parameter	Well Sites	Pipelines
Water Quality	Sediment disruption from removing facilities. Turbidity plume in canal and river as dredged area is returned to its original contours. Concomitant release of oxygen-demanding organics and any soluble nutrients. Sediment resuspension and engine exhaust discharges from supply/crew boats.	Sediment disruption from removing above ground structures. Pipelines remain in ground.
Hydrology	Only local obstructions of natural natural currents from barges/boats moored in the river assuming pre-development site conditions can be achieved.	Not affected except slowly as natural wetland vegetation fills pipeline right-of-way.
Wetland Ecosystems	Canals and slips restored by filling with stockpiled dredged material and extra fill as needed; recovery under platform and trestle.	Vegetation succession would result in regrowth similar to adjacent areas.
Aquatic Ecosystems	Refilling canals and slips would bury aquatic ecosystem that had developed. Ending of vessel traffic would eliminate turbidity from propwash.	Not affected if pipelines abandoned in place.
Wastewater Disposal	Sanitary wastes from personnel stored in tanks/barge and hauled to treatment plant for processing and disposal.[1]	Flushing fluids collected at processing plant.
Groundwater	Possibility of improperly plugged well providing conduit for formation waters to flow to surface and impact shallow aquifers through infiltration or loss directly from abandoned well to freshwater aquifer.	No discernible impact.
Noise	Noise level increase due to general construction activities: Welding: 77 dBA (average) Backhoe: 85 dBA, 50 ft.	Same as well sites but only applicable to above ground structures. Pipes remain in ground.
Solid Waste	Generation of general construction waste. Impact minimal. Disposed of at an approved site.	Same as well site for above ground structures. Pipes remain in ground.
Air Emissions	Emissions from service vehicles. Emissions (in tons per year): TSP (.003), SO2 (.006), CO (.05), HC (.008) and NOX (.004).	
Socioeconomic Characteristics	Employment to remove platform and equipment. 4 to 10 to remove mooring structure and 8 to 10 needed to refill canal and slip. Local nursery could revegetate and monitor succession. Severance tax and royalty collection would terminate.	At most a small crew would flush and clean the pipeline. No significant effects would be likely.
Navigation	Increased waterway traffic (barge, crew boat); estimated maximum increase: 3-5 trips per day (1-2 barges, 2-3 crew boats); removal of production platform and mooring piles from channel would remove potential hazard to navigation.	Not applicable.

[1]No discharges are allowed from platforms or drilling barges with the exception of uncontaminated bilge and ballast water; discharges from marine vessels are allowed in conformance with U.S. Coast Guard regulations.

					ENHANCED RECOVERY	
	INLAND BARGE TRAFFIC	[illegible]	BOARD ROAD AND [illegible]	AIR LIFT	PUMPING	MATERIAL INJECTION
[illegible]	Similar to increased noise from well completion, generators, and support vehicles. [illegible]	Same as inland barge traffic.	Same as inland barge traffic.	Increased noise levels due to the use of compressors and pumps and service vehicles.	Pump: 76 dBA, 50 ft. Air compressor: 92-100 dBA, at source. Lug: 94 dBA (50), 100 ft. No pump/compressor noise if pressurized gas is recycled (via pipes) from treatment plant.	
[illegible]	Production of drilling fluids similar to exploratory drilling, muds, cement, additives, and fracturing chemicals. Drilling fluids [illegible] wells. Diesel power at approved site.	Same as inland barge traffic.	Same as inland barge traffic.	No discernible impact, assuming no new wells are drilled	No discernible impact.	No discernible impact.
[illegible]	Same as initial drilling operation.	Same as inland existing well [illegible]	The [illegible]	If new pipeline was needed, requirements and effect would be the same as initial operating.	Same as equipment installation on production platforms.	If new wells, pipelines or platform equipment are needed effects would be the same as initial activities.
[illegible]	Increased waterborne traffic. Number of workers [illegible] new [illegible] estimated maximum [illegible] trips per day. Range [illegible] new [illegible]	Same as initial barge work at platforms not [illegible] new [illegible] range [illegible] trips per day.	Not applicable.	Not applicable.	Not applicable.	Similar to initial drilling operation.

TABLE 2-4 (Concluded)
SUMMARY OF ENVIRONMENTAL LOADING AND GENERATION OF SYNTHETIC HYDROCARBON PRODUCTION IN THE W

PARAMETER	WELL COMPLETION	GATHERING SYSTEM CONSTRUCTION: WETLANDS	GATHERING SYSTEM CONSTRUCTION: RIVER CROSSING: BORING	GATHERING SYSTEM CONSTRUCTION: RIVER CROSSING: TRENCHING	NORMAL OPERATION OF WELLS AND PIPELINE GATHERING SYSTEM	INLAND BARGE FIE
NOISE	Increase in noise levels associated with operation of generally smaller drilling rig. Also noise from pumps, compressors, lifts and boats. Pumps: 76 dBA, 20 ft. Air Compressor: 92-100 dBA, at source.	Increased noise levels from land clearing (forested wetlands), dragline/backhoe (wetlands), land trenching: 88 dBA (average).	Same as wetland/water, substituting a boring rig for trenching equipment.	Same as wetland water.	Intermittent noise associated with lease flow and maintenance. Motorboat: 86 dBA, 50 ft. Gas venting (blowdown): 80 dBA (with silencer), 130 dBA (without).	Similar to increa noise from well completion, gener of a shorter dura (1-8 weeks).
SOLID WASTE	Production of small amounts of cuttings and muds, mostly formation fluids with completion additives. Disposed of at an approved site.	No discernible impact.	Cuttings and inert muds generated equal to the volume of the bore. Disposed of at an approved site.	No discernible impact.	No discernible impact.	Production of fl fluids similar to exploratory dril muds, cement, ca and fracturing s scale. Drilling 2,000 ft; wel... posed at approve
SOCIOECONOMIC CHARACTERISTICS	One of the busiest phases; traffic and personnel increase. 8-15 additional people on board at once. More barges and tugs, probably from local business. A crew of about 10 needed to install production platform and minimum equipment.	50 to 100 workers needed to survey, clear, lay and secure the pipe. 60% could be local labor. Monetary influx to acquire rights-of-way. Temporary effects on wages, taxes, and local purchases. Traffic increases at staging area from workers and material deliveries.	Employment for 50 people. Specialized crew used, stays in local motel for the 4-6 weeks of the project. Little if any local employment. Minor retail purchases made by employees, short term traffic increase at landing, crew boats could be locally contracted.	Personnel and effects same as in gathering system construction in wetlands.	State begins to enhance tax and royalty collection. A $30/bbl oil could earn $3 severance and $3 royalty. A mmBtu of gas at $3.40 could earn 34¢ severance and 80¢ in royalties. Few people needed to monitor well and care for platform equipment; it's long term employment. Pipeline is mostly automated.	Same as initial off shore drill operation.
NAVIGATION	Increased waterway traffic (crew boat, supply barges); estimated maximum increase: 7 trips per day (1 barge, 6 crew boats), 12-14 trips per day for a 6 crew boats), 12-14 trips per day for a platform rig (1 barge, 11-13 crew boats).	Not applicable.	Not applicable.	For hydraulic dredging, up to half of waterway blocked by a floating discharge pipe connecting the dredge with either of two upland dredged material stockpile areas; on narrow waterways with one side only stockpile area, the entire channel would be blocked. For draglinedredging, navigation would be affected only in the immediate vicinity of the dredge.	Minimal increase in waterway traffic: 1-2 trips by small craft or crew boat.	Increased waterw traffic (barge-m workover rig, ba crew boat); esti maximum increase trips per day (1 1-3 crew boats).

[1]No discharges are allowed from platforms or drilling barges with the exception of uncontaminated bilge and ballast water; discharges from marine vessels are allowed in conformance with U.S. Coast Guard regulations.

TABLE 2-4

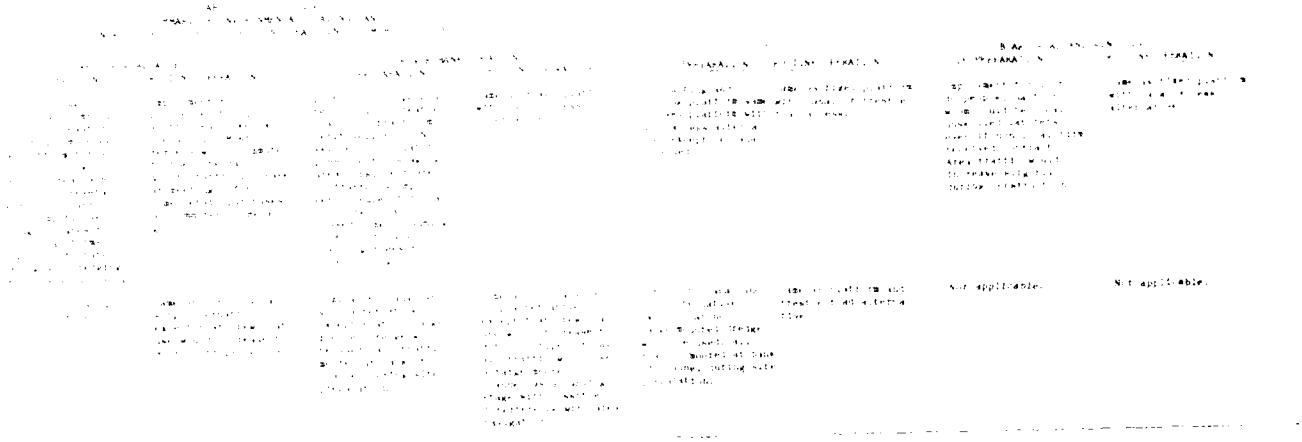
ENVIRONMENTAL LOADING AND GENERIC ENVIRONMENTAL EFFECTS OF HYDROCARBON PRODUCTION IN THE MOBILE DELTA

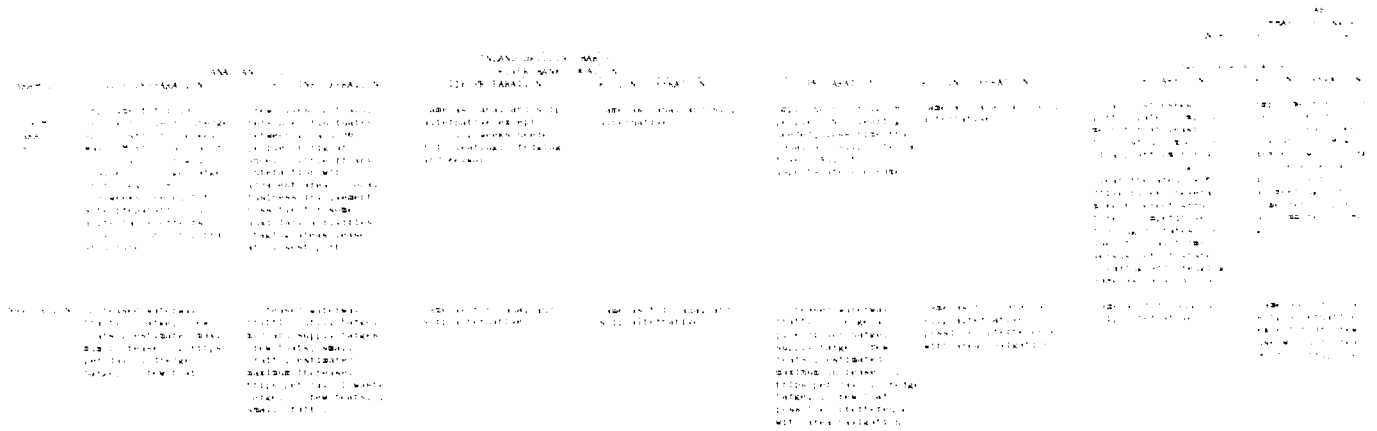
[illegible]	INLAND BARGE RIG	[illegible]	[illegible]	[illegible]	ENHANCED RECOVERY: PUMPING	ENHANCED RECOVERY: MATERIAL INJECTION
[illegible]	Same as Well Completion.	Same as Well Completion.	[illegible]	Same as Well Completion.	Same as Well Completion.	Same as Well Completion.
[illegible]	Same as Normal Operation of Wells and Pipelines.	Same as Normal Operation of Wells and Pipelines.	[illegible]	Same as Normal Operation of Wells and Pipelines.	Same as Normal Operation of Wells and Pipelines.	Same as Normal Operation of Wells and Pipelines.
[illegible]	No additional wetland area disturbed.	No additional wetland area disturbed.	[illegible]	No additional wetland area disturbed.	No additional wetland area disburbed.	No additional wetland area disturbed if existing well converted to material injection; for any new well, the amount of wetland altered would be the same as described for the various drilling alternatives in Table 4-2.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible] affected if pipeline installed, effects similar to gathering line installation.	Some turbidity if wellhead platform is installed.	For new wells effects same as for original drilling and pipeline crossing; for use of existing wells turbidity increase from service vessel propwash.
[illegible]	Same as Well Completion.	Same as Well Completion.	Same as Well Completion.	Same as Well Completion.	Same as Well Completion.	Same as Well Completion.
[illegible]	[illegible]	[illegible]	[illegible]	Possible contamination from drilling new well (i.e., inland barge). Otherwise, no discernible impact.	Not applicable.	Contamination same as inland barge. Over pressure casing rupture may cause loss of solvents enhancement or formation fluids to a freshwater aquifer.
[illegible]	[illegible]			Emissions from pumps and compressors and associated transportation activities, assuming no new wells are drilled. Emissions (in tons per year): TSP (.026), SO2 (.052), CO (.458), THC (.075), and NOx (.038).		

TABLE 2-4

SUMMARY OF ENVIRONMENTAL LOADING AND GENERIC ENVIR[...]
HYDROCARBON PRODUCTION IN THE MOBILE DE[...]

PARAMETER	WELL COMPLETION	GATHERING SYSTEM CONSTRUCTION: WETLANDS	GATHERING SYSTEM CONSTRUCTION: RIVER CROSSING: BORING	GATHERING SYSTEM CONSTRUCTION: RIVER CROSSING: TRENCHING	NORMAL OPERATION OF WELLS AND PIPELINE GATHERING SYSTEMS	INLAND BARGE RIG
WATER QUALITY	Sediment resuspension and engine exhaust discharges from crew/supply boats and tugs. Resuspension of sediments from construction related activities.	Sediment movement resulting in some leaching of nutrients, metals and humic materials.	Sediment from runoff. Possible drilling fluid contamination from exit hole and sediment from associated dike.	Sediment suspension during dredging of trench.	Sediment resuspension and engine exhaust discharges from crew/supply boats and tugs. Water quality in any canal or slip would be less favorable than in river channel.	Same as well complet[...]
HYDROLOGY	Local obstruction of current by barges/boats/tugs in river.	No discernible impact if pipeline trenches are plugged and filled following pipeline installation.	Local obstruction of current by exit hole dike.	Local obstruction of current by dredge barge and exposed pipeline trenches.	Local obstruction of current by rig/barges/boats/tugs in river. Water circulation is less favorable in canals than in river channel.	Same as Normal Operat[...] of wells and pipeline[...]
WETLAND ECOSYSTEM	No additional effects would occur.	1 acre disturbed per 1000 feet of gathering line system (1/3 acre is dredged, 2/3 acre is work area).	1/4 to 1/2 acre disturbed for directional drilling rig (area cleared and board pad set down).	10 to 12 acres disturbed by fixed dredged material holding areas if hydraulic dredging is used.	Continued loss or reduction of habitat values.	No additional wetland area disturbed.
AQUATIC ECOSYSTEM	Continuation of effects produced by drilling.	Some turbidity from runoff.	Not affected.	1 acre of benthic habitat disturbed per 100 feet of pipeline; temporary loss of benthic communities and habitat area; localized turbidity.	Little effect on aquatic ecosystem; recolonization of trenched pipeline area and other dredged areas; new aquatic habitat established within any canal and slip; turbidity increase from service vessels.	Turbidity increase for any site preparation and from vessel [...]propwash.
WASTEWATER DISPOSAL	Sanitary wastes from personnel, stormwater runoff from platforms, bilge and ballast water from boats and barges. No discharge; waste is stored on barges and hauled to treatment plants for disposal.	Sanitary waste from personnel stored in holding tanks and hauled to treatment plant for disposal.	Same as wetlands gathering system construction.	Same as wetlands gathering system construction.	Formation waters separated and deep well injected. Sanitary waste at processing plant treated and disposed of through septic tank system or municipal wastewater treatment system.	Same as well complet[...]
GROUNDWATER	Possible aquifer contamination from formation additives due to unintentional fracturing of and subsequent communication through aquicludes. Introduction of hydrocarbons and formation waters and additives by casing ruptures during fracturing efforts.	No discernible impact.	Possible contamination of shallow aquifer due to loss of drilling fluid.	No discernible impact.	Potential for contamination of shallow aquifer due to pipeline failure and deeper aquifers due to well casing rupture. Potential for contamination of aquifers by communication between strata or failure of injection well integrity during injection of produced waters.	Same as exploratory drilling, with gener[...] reduced activities and the addition of solvents and other formation additives
AIR EMISSIONS	Emissions from service vehicles and drill rig at rates reduced from exploratory drilling and generally with a smaller rig. Temporary use of compressors and pumps. Emissions (in tons per year, not including rig): TSP (0.006), SO2 (.011), CO ([illegible]), THC (.012), and NOX (.0081).	Emissions from backhoe/dragline type equipment. Emissions (in tons per year): TSP (.013), SO2 (.114), CO (.336), THC ([illegible]), and NOX ([illegible]).			Emissions from pumps, compressors and flaring. Emissions (in tons per year): TSP ([illegible]), SO2 ([illegible]), [illegible], THC ([illegible]), and NOX ([illegible]).	Emissions from ser[...] compared to explorat[...] Emissions (in tons [...]) [illegible]


Not applicable.
Not applicable.



(*) No discharges are allowed from platforms or drilling barges with the exception of uncontaminated bilge and ballast water, like discharges from marine vessels are allowed in conformance with U.S. Coast Guard regulations.

TABLE 2-9
NVIRONMENTAL LOADINGS AND GENERIC EFFECTS OF
TION IN MOBILE BAY AND MISSISSIPPI SOUND

...ING SYSTEM ...NSTRUCTION			...MAL OPERATION OF ... AND PIPELINE GATHERING SYSTEMS	WELL WORKOVER
...YSTEM	WETLAND ECOSYSTEM	BARRIER ISLAND		
...ecosystems. ...spension ... release ... oxygen ...diments. ... bottom ... to wet- ...sediment ...ting in ... nutrients, ... materials.	Sediment resuspension and engine exhaust discharges from crew/ supply boats and tugs.	Sediment resuspension from dredging in surf zone or drill site preparation. Engine exhaust discharges from crew and supply boats. Localized effect from lost drilling mud at exit site for boring method.	Sediment resuspension and engine exhaust discharges from crew/ supply boats and tugs.	Sediment resuspension and engine exhaust discharges from crew/ supply boats and tugs.
...ecosystems, ...tion of ...ent at. ... bottom ...tion.	Channelization of water through pipeline trenches would occur.	Local obstruction of current by vessels.	Local obstruction of current by rig/barge/ boat. Local circulation changes in dredge areas.	Local obstruction of currents by barge/boat.
...	About 1 acre disturbed per 1000 feet of gathering system (1/3 acre for dredged trench, 2/3 acre for work area and dredged material stock pile).	Same as Wetland Ecosystem column if trench and cover method used. No effect if boring method used.	Continue loss of wetland habitat in canal and slip; beginning of salt marsh recovery along gathering system.	No additional wetland effects.
... acres of ...at per 1000 ...line during ... turbidity ...ntic ...djacent ...rea.	Not applicable.	Short term disturbance of benthic community in trench corridor. Slight effect at drilling site and exit site with boring method.	No new disturbances to benthic communities gathering line corridor would recolonize but uneven bottom after refilling trench could alter recolonization.	No additional disturbance if p... ...ction platform used; for new rig, effects would be same as for drilling.
...Completion.	Same as Well Completion.	No discharge from drilling vessel. Discharges allowed by regulation from service vessels.	Formation waters separated at processing plant and/or deep-well injected. Sanitary waste at processing plant treated and disposed through septic tank system or municipal wastewater treatment system.	Same as Well Completion.
...le Impact.	Possible contamination of shallow aquifer due to pipeline failure.	No effect likely from trench and cover method. Possible for some salt water intrusion with boring method.	Possible contamination of aquifers by communication between strata or failure of injection well integrity during injection of produced waters.	Same as exploratory drilling with generally reduced activities on the addition of formation additives.

TABLE 2-9 (Concluded)
SUMMARY OF ENVIRONMENTAL LOADINGS AND GENE
PRODUCTION IN MOBILE BAY AND MISSISSI

PARAMETER	WELL COMPLETION	PLATFORM CONSTRUCTION	GATHERING SYSTEM CONSTRUCTION	
			ESTUARINE ECOSYSTEM	WETLAND ECOSYSTEM
AIR EMISSIONS	Emissions from service vehicles and drill rig at rates reduced from exploratory drilling and generally with a smaller rig. Temporary use of compressors and pumps. Emissions (in tons per year): TSP (.044), SO_2 (.032), CO (1.039), THC, not including rig (.096) and NOX (.103).		Emissions from drag-lines, hydraulic jet trenches and support craft. Emissions (in tons per year): TSP (.146), SO21 (.106), CO (3.462), THC (.319) and and NOX (.344).	
NOISE	Increase in noise levels associated with operation of smaller drilling rig. Noise also from pumps, compressors, lifts and boats. Motorboat: 80 dBA, (avg.) 50 ft. Pumps: 76 dBA, 50 ft. Air compressor: 92-100 dBA.	Increase in noise levels due to general construction activities. Welding: 77 dBA (avg.), 50 ft. Pneumatic tools: 90-116 dBA, operator's position.	Increased noise levels from dragline/ backhoe equipment, and marine traffic. Trenching: 88 dBA (land average). Large tug, loaded: 54-55 dBA (L_{50}), 100 ft.	
SOLID WASTE	Production of small amounts of cuttings and muds, mostly formation fluids with completion additives.	No discernible impact.	No discernible impact.	No discernible impact.
SOCIOECONOMIC CHARACTERISTICS	Personnel increases: 28-51 on board at once. More traffic at staging area. Additional tugs possibly needed; 2-4 jobs per vessel; could use local firm.	10 people to prepare site. 80 workers (40 each shift) needed for installation. Forty more to place equipment. Only a few jobs for locate if regional firm won contract. Traffic increase at staging area and retail purchases by workers to and from job.	120 workers for 5-line system over several months, 60 in each tour; 10 could be local. Traffic increases at staging area, only minor purchases made by commuters. Right-of-way for landfall could result in a revenue influx, other effects are short term.	100 workers for wetland segment of onshore system, 60 could be local. Wages would circulate locally. Traffic would increase at meeting points. All effects are transitory.
NAVIGATION	Increased waterway traffic (supply barge, crew boat); estimated maximum increase: 8 trips per day (2 barges, 6 crew boats).	Increased waterway traffic (derrick barge, supply barge, crew boat); estimated maximum increase (at start of installation): 8 to 9 trips per day (3 barges, 5 to 6 crew boats).	Potential navigation impact while trenching across Intracoastal Waterway; dredged material pile next to pipeline waterway traffic in shallow areas until trench is backfilled.	Not applicable.

TABLE 2-9 (Concluded)
...F ENVIRONMENTAL LOADINGS AND GENERIC EFFECTS OF
...DUCTION IN MOBILE BAY AND MISSISSIPPI SOUND

...ING SYSTEM CONSTRUCTION ...OSYSTEM	WETLAND ECOSYSTEM	BARRIER ISLAND	NORMAL OPERATION OF WELLS AND PIPELINE SYSTEMS	WELL WORKOVER
...om drag-lines, hydraulic jet ... support craft. ... tons per year): TSP (.146), ... (3.462), THC (.319) and ...		Similar to upland operations (Table 2-18) for trench and cover method. Similar to river crossing (Table 2-4) for boring method.	Emissions from pumps, compressors and flaring. Emissions (in tons per year): TSP (1.49), SO2 (.506), CO (133.40), THC (3.62) and NOx (39.34).	Emissions from service vehicles and a generally smaller workover rig as compared to exploratory drilling, operating for only 3 to 8 months. Emissions (in tons per (year, not including rig): TSP (.08), SO2 (.063), CO (2.088), THC (.192)
...ise levels from dragline/ ...pment, and marine traffic. ...50 dBA (land average). ...ated: 54-55 dBA (L_{50}),		Similar to upland operations (Table 2-18) for trench and cover method. Similar to river crossing (lable 2-4 for boring method.	Intermittent noise associated with inspection and maintenance. Motorboat: 80 dBA (avg.) 50 ft. Gas venting (blowdown): 80 dBA (*with silencer*); 140 dBA (without) Helicopter: 70-90 dBA, 1000 ft.	Similar to noise level of well completion slightly increased and of shortened duration
...le impact.	No discernible impact.	No discernable impact.	No discernible impact.	Production of drilling waste similar to exploratory drilling, including muds, cements, cuttings, and fracturing chemicals. Drilling fluids: 2,000 bbl/well.
...for 5-line ...several ...n each ...ld be local. ...eases at ..., only ...es made ... Right- ...andtail ... in a ...ux, other ...short term.	100 workers for wetland segment of onshore system, 60 could be local. Wages would circulate locally. Traffic would increase at meeting points. All effects are transitory.	Similar to upland operations (Table 2-18) for trench and cover method. Similar to river crossing (Table 2-4) for boring method.	Average of 10 people needed to monitor platform equipment. Pipeline is mostly automated, small local crew could be used. Employment is long term. Wages would circulate locally. An Alabama offshore $30/bbl. of oil could earn $2.40 in severence and $7.50 royalty while MMBtu's gas could earn 28¢ severence and 86¢ royalty. At same value a Mississippi bbl. of oil could earn $1.80 severence and $6 royalty while a MMBtu of gas could earn 2¢ severence and 70¢ royalty in addition to maintenance tax.	Same as initial drilling. 20-36 in a crew, little interaction with adjacent community. Operation would last at least several weeks.
...vigation ... trenching ...oastal ...dged ... next ...aterway ...allow ...rench ...	Not applicable.	Negligible effect.	Few potential effects expected.	Increased waterway traffic same as for routine operations during drilling

TABLE 2-10

SUMMARY OF ENVIRONMENTAL LOADINGS AND GENERIC EFFECTS OF WELL FIELD ABANDONMENT IN MOBILE BAY AND MISSISSIPPI SOUND

Parameter	Well Site	Pipelines
Water Quality	Sediment disruption from removing facilities. Sediment resuspension from refilling access canals to original contours. Concomitant increase in turbidity and release of nutrients and oxygen-demanding organics. Sediment resuspension in shallow waters and engine exhaust discharges from supply/crew boats.	Sediment disruption from removing above ground structures. Pipelines remain in ground.
Hydrology	Local obstruction of tidal currents from moored barges and boats. Shell pads remaining following abandonment could alter local navigation and fishing patterns.	Not affected
Wetland Ecosystem	Canal and slip refilled, recovery of wetland vegetation.	Not affected.
Aquatic Ecosystem	Short-term turbidity increase with potential effects on seagrass beds; any shell pad could become substrate for oyster larvae.	Not affected.
Wastewater Disposal	Sanitary wastes from personnel stored in tanks/barge and hauled to treatment plant for processing and disposal.	Flushing fluids collected at processing plant.
Groundwater	Possibility of improperly plugged well providing conduit for formation waters to flow to surface and impact shallow aquifers through infiltration, or loss directly from abandoned well to freshwater aquifer.	No discernible impact.
Air Emissions	Emissions from service vehicles. Emissions (in tons per year): TSP (.003), SO2 (.006), CO (.05), HC (.008) and NOX (.004).	
Noise	Noise level increase due to general construction activities: Welding: 77 dBA (average) Backhoe: 85 dBA, 50 ft.	Same as well sites but only applicable to above ground structures. Pipes remain in ground.
Solid Waste	Generation of general construction waste. Impact minimal. Disposed of at an approved site.	Same as well site for above ground structures. Pipes remain in ground.
Socioeconomic Characteristics	Termination of severance taxes and royalties collected by and distributed from the state. A crew about the same size as in platform installation would remove structure. 4-10 people could dismantle mooring and piles. Backfilling could be necessary in salt marsh, local crew could be used.	Small crew, possibly local labor, would flush and clean the line.
Navigation	Increased waterway traffic for equipment removal and any restoration efforts; estimated maximum increase: 5 trips per day (2 barges, 3 crew boats); rig or platform removal would remove potential hazard to navigation.	Not affected.

TABLE 2-11

SUMMARY OF THE EFFECTS OF SPILLS OF MATERIAL OR RELEASE TO THE ATMOSPHERE OF NATURAL GAS CONTAINING H_2S IN MOBILE BAY AND MISSISSIPPI SOUND

ACCIDENT	EFFECT
	-DRILLING-
Spills	
Crude Oil	Low probability of encountering oil in formations under Bay or Sound. Large uncontained spill, if one occurred, could cause extensive mortality in area receiving oil. Oil reaching sediments and salt marshes could remain for many years.
Fuel Oil	Typically 75,000 to 100,000 gallons in drilling rig storage tanks. 40,000 gallons in fuel transport barges. Effects of spill would be similar to crude oil spill.
Chemicals	Volumes spilled would be small. Effects, if any, would be localized because of dilution.
Drilling Fluids	Most material would sink to bottom at site of spill. Turbid plume of small quantity of material would extend away from site. Effect would depend on location of accident. Oyster reefs would be more sensitive than other locations. Most effects would be localized.
Natural Gas Containing H_2S	Most gas would bubble to surface. Methane would be only sparingly soluble. Hydrogen sulfide could reach concentration greater than 0.5 ppm hazardous to marine organisms. would be oxidized and diluted fairly rapidly. Large crater could form at well site if casing has been breached below sediment surface. Extensive resuspension of sediments and redeposition around crater.
Atmospheric Release of Gas Containing H_2S	Well blowouts are more likely to occur where they affect oil company personnel. In general, procedures for minimizing the likelihood of such an event have been well documented and safety training is an integral part of oil rig personnel. Concentrations usually are less than 100 ppm relatively close to the source. The hazard is dependent upon the distance between the location of the accident and the prevailing wind at the time of the accident, *regardless of the geographical area.* H_2S is heavier than air, but normally it is released under pressure and mixed with methane which is lighter than air. Initially, there would be some vertical distribution of the H_2S because of mixing with methane. Most regulatory agencies require that the applicant show a "fail-safe" or emergency planning analysis which would preclude major hazards to the public or flora and fauna. Generally, the belief is that concentrations greater than 10.0 ppm over 8 hours should be avoided.
Socioeconomic Characteristics	Tourism and recreation industries in study area are vulnerable to significant economic losses from an accident. Mississippi lodging and sport fishing is worth $183 million annually. Alabama coast accounts for $625 million of state tourist industry.
	-PRODUCTION-
Spills	
Well Servicing	Solvents and materials used in small volumes would be very localized.
Pipeline Rupture	Could release crude oil (if discovered in region), water or gas containing hydrogen sulfide and/or corrosion inhibitor. Effects of crude oil or natural gas would be the same as in the drilling phase. Spill of corrosion would be like the spill of a heavy crude oil.
Well Workover	Activities are similar to drilling phase. Spills would be similar to those described for drilling.
Pipeline Rupture Releasing Natural Gas Containing H_2S	Studies of various site, essure and duration pipeline ruptures indicate that up to 11 million cubic feet of dry gas may be released. Under these conditions, concentrations between 117 and 154 ppm have been calculated at distances equal to or less than 200 meters from the break. H_2S is heavier than air, but normally it is released under pressure and mixed with methane which is lighter than air. Initially, there would be some vertical distribution of the H_2S because of mixing with methane. Most regulatory agencies require that the applicant show a "fail-safe" or emergency planning analysis which would preclude major hazards to the public or flora and fauna. Generally, the belief is that concentrations [illegible] ppm over [illegible] should be avoided.
Socioeconomic	Same as drilling.

TABLE 2-12

SUMMARY OF ENVIRONMENTAL LOADINGS AND GENERIC EFFECTS OF THE USE OF SEISMIC SURVEY BOATS FOR GEOPHYSICAL EXPLORATION IN ALABAMA AND MISSISSIPPI STATE WATERS OF THE GULF OF MEXICO

Parameter	Effect
Surface Water Resources	Same as for seismic survey boats in Mobile Bay and Mississippi Sound (see Table 5-1).
Aquatic Ecosystem	Slight disturbance from survey boat and air gun operations.
Wastewater Disposal	Discharges from the boats with sanitation devices approved by the U.S. Coast Guard are allowed. Effects are localized and short-term. Boats without toilet facilities are not affected by Coast Guard regulations.
Air Emissions	Emissions from survey vehicles (in tons per year): TSP (.582), SO_2 (.423), CO (13.776), HC (1.28) and NOX (1.38).
Noise	No discernible impact. Noise levels similar to ambient marine traffic.
Solid Waste	Not applicable.
Socioeconomic Characteristics	15-16 people needed on 2 vessels; 2-3 could be local hires. Interaction with shore is intermittent; mostly purchases of food, fuel and minor repairs.
Navigation	Potential impact from survey boat towing two-mile long seismic cable.

TABLE 2-13

SUMMARY OF ENVIRONMENTAL LOADINGS AND GENERIC EFFECTS OF DRILLING IN ALABAMA AND MISSISSIPPI STATE WATERS OF THE GULF OF MEXICO

Parameter	Jackup and Submersible Drilling Rig		Fixed Platform	
	Site Preparation	Routine Operation	Site Preparation	Routine Operation
Water Quality	Sediment disruption by legs of jack-up rig, pile driving. Creosote residue from timber piles. Engine exhaust discharges from crew/supply boats and tugs.	Engine exhaust discharges from crew/supply boats and tugs.	Sediment disruption during construction of platform. Creosote residue from timber piles. Engine-exhaust discharges from crew/supply boats and tugs.	Engine exhaust discharges from crew/supply boats and tugs.
Hydrology	Local disturbance of currents around barges and boats.	Local disturbance of currents around rigs, barges and boats.	Same as Jack-up.	Same as Jack-up.
Aquatic Ecosystem	Temporary loss of 0.2 acres of benthic habitat under jackup legs, 0.4 to 0.7 acres under hull of submersible; fouling community habitat created on underwater portions of both rigs; localized turbidity increase during rig emplacement.	Continued loss of benthic habitat for drilling period.	Very small amount of benthic area disturbed by platform legs; localized short-term turbidity increase during platform emplacement; fouling community habitat created on legs of platform.	Continued loss of benthic habitat for drilling period.
Wastewater Disposal	Sanitary wastes from personnel, stormwater runoff from platforms. No harmful discharge allowed to state waters.[1] Waste is stored on barges and hauled to treatment plants or to Federal Gulf waters if approved for disposal.	Sanitary wastes from personnel, stormwater runoff from platforms, bilge and ballast water from boats and barges, drilling mud liquids and formation water. No harmful discharge allowed to state waters[1]; Waste is stored on barges and hauled to treatment plants or to Federal Gulf waters if approved for disposal.	Same as Jack-up.	Same as Jack-up.
Groundwater	Not applicable.	Possible contamination of freshwater aquifer by exposure to drilling muds, formation waters or hydrocarbons through improperly sealed wells, casing ruptures, or natural fractures in aquicludes. Possibility for contamination of shallow aquifers due to leachate from drilling mud disposal.	No discernible impact.	Same as Jack-up.
Air Emissions	Emissions from drill rig and support vehicles. Includes rig activity during completion and workover. Emissions (in tons per year): TSP (14,971), SO2 (27,104), CO (199,195), HC (6,256) and NOx (493,726).			

TABLE 2-13 (continued)

SUMMARY OF ENVIRONMENTAL LOADINGS AND GENERIC EFFECTS OF DRILLING IN ALABAMA AND MISSISSIPPI STATE WATERS OF THE GULF OF MEXICO

Parameter	Jackup and Submersible Drilling Rig		Fixed Platform	
	Site Preparation	Routine Operation	Site Preparation	Routine Operation
Noise	Noise level increase due to marine traffic and transport by helicopter. Large tug, loaded: 54 dBA (L_{50}, 100 ft. Tug along: 47 dBA (L_{50}), 100 ft. Motorboat: 80 dBA (avg.), 50 ft. Helicopter: 70-90 dBA, 1000 ft.	Increase in noise levels from operation of drilling equipment and support activities: Generic drill rig: 85 dBA, 100 ft.	Same as jack-up, with additional construction equipment.	Same as jack-up.
Solid Waste	No discernible impact. Dredge material from marsh remains on site for reclamation.	Production of spent drilling muds and cuttings (per av. 21,000 ft. well). Liquids: 23,500-184,000 bbl. Cuttings: 6,000-9,000 bbl. Muds: 6,000-17,000 bbl. Disposed of at an approved site	No discernible impact	Same as jackup
Socioeconomic Characteristics	Up to 12 people needed to bore soil. 4-10 jobs to drive piles for mooring. Extra tug crew could be contracted with 2-4 in crew. Rigging up involves typical drilling complement of 20-36 people.	Self contained operation, 20-36 people on board 24 hours a day; little if any interaction with adjacent economy. Equipment and supplies transported directly from source or shuttled through staging dock; adequate ports available in Mississippi and Alabama.	Existing regional facilities could be used to construct platform modules. 50-80 people needed to install structure offshore; only a few positions filled by locals. Tugs could be local, 2-8 people needed. 1 month to install a platform.	Same as jackup or submersible drilling rig.
Navigation	Increased waterway traffic (pile driver barge, supply barge, crew boat); estimated maximum increase: 3 trips per day (1 barge, 2 crew boats); 200 to 250 foot square work area closed to navigation.	Increased waterway traffic (mud and supply barge, crew boat); estimated maximum increase: 5 trips per day (1 supply barge, 1 waste barge, 3 crew boats); continued closure of drilling area to navigation.	Increased waterway traffic (pile driver barge, platform module barge, crew boat); estimated maximum increase: 4 trips per day (2 barges, 2 crew boats); 300 foot square work area closed to navigation.	Increased water traffic same as for jackup or submersible; continued closure of drilling area to navigation.

[1]No discharges are allowed from platforms or drilling barges with the exception of uncontaminated bilge and ballast water; discharges from marine vessels are allowed in conformance with U.S. Coast Guard regulations.

TABLE 2-14

SUMMARY OF ENVIRONMENTAL LOADINGS AND GENERIC EFFECTS OF HYDROCARBON PRODUCTION IN ALABAMA AND MISSISSIPPI STATE WATERS OF THE GULF OF MEXICO

Parameter	Well Completion	Platform Construction	Gathering System Contruction	Normal Operations of Wells and Pipeline Gathering System	Well Workover
Water Quality	Sediment resuspension and engine exhaust discharges from crew/supply boats and tugs. Resuspension of sediments from construction-related activities.	Sediment disruption during construction of platform. Creosote residue from timber piles. Engine exhaust discharges from crew/supply boats and tugs.	Sediment resuspension from dredging. Release of nutrients and oxygen demand from sediments.	Sediment resuspension and engine exhaust discharges from crew/supply boats and tugs.	Sediment resuspension and engine exhaust discharges from crew/supply boats and tugs.
Hydrology	Local obstruction of currents by barge/boat.	Local obstruction of natural currents by barge/boat.	Local obstruction of natural current by barge/boat. Local changes in bottom water circulation due to pipeline trenching.	Local obstruction of natural current by rig/barge/boat. Local changes in bottom water circulation in dredged areas.	Local obstruction of natural current by barge/boat.
Aquatic Ecosystem	Continued effects as described for drilling if existing rig used; localized turbidity increase if smaller rig used.	Effects the same as for drilling platform (localized turbidity, fouling community habitat created on platform legs).	2 1/2 acres of benthic habitat disturbed per 1000 feet by jet sled method; 4 1/2 acres disturbed per 1000 feet by hydraulic dredging method.	No new disturbances to benthic communities; gathering line corridor would recolonize but uneven bottom after refilling trench could alter community established.	No additional disturbance if production platform used; for new rig, effects would be same as for drilling.
Wastewater Disposal	Sanitary wastes from personnel, stormwater runoff from platforms, bilge and ballast water from boats and barges. No harmful discharge allowed to state waters[1]; waste from well sites is stored on barges and hauled to treatment plants or to Federal Gulf waters if approved for disposal.	Same as Well Completion.	Same as Well Completion.	Formation waters separated and deep-well injected. Sanitary wastes at processing plant treated and disposed of through septic tank system or municipal wastewater treatment system.	Same as Well Completion.

TABLE 2-14 (continued)

SUMMARY OF ENVIRONMENTAL LOADINGS AND GENERIC EFFECTS OF HYDROCARBON PRODUCTION IN ALABAMA AND MISSISSIPPI STATE WATERS OF THE GULF OF MEXICO

Parameter	Well Completion	Platform Construction	Gathering System Contruction	Normal Operations of Wells and Pipeline Gathering System	Well Workover
Groundwater	Possible aquifer contamination from formation additives due to unintentional fracturing of and subsequent communication through aquicludes. Introduction of hydrocarbon and formation waters and additives by casing ruptures during fracturing.	Not applicable.	No discernible impact.	Contamination of shallow aquifer due to pipeline failure and deeper aquifers due to well casing rupture. Contamination of aquifers by communication between strata or failure of injection well integrity during injection of produced waters.	Same as exploratory drilling with generally reduced activities and the addition of formation additives.
Air Emissions	Emissions from service vehicles and drill rig at rates reduced from exploratory drilling and generally with a smaller rig. Temporary use of compressors and pumps. Emissions (in tons per year, not including rig): TSP (.175), SO2 (.127), CO (4.133), HC (.384) and NOX (.414).		Emissions from draglines hydraulic jet trenches and support craft. Emissions (in tons per year): TSP (.582), SO2 (.423), CO (13.78), HC (1.280) and NOX (1.380).	Emissions from pumps, compressors and flaring. Emissions (in tons per year): TSP (5.665), SO2 (3.57), CO (233.32), HC (9.16) and NOX (149.35).	Emissions from a generally smaller workover rig as compared to exploratory drilling, operating for only 3 to 8 months Emissions (in tons per year, not including rig): TSP (.172), SO2 (.127), CO (4.133), HC (.384) and NOX (. 414).
Noise	Increase in noise levels associated with operation of generally smaller drilling rig. Also noise from pumps, compressors, lifts and boats. Motorboat: 80 dBA (avg.), 50 ft. Pumps: 76 dBA, 50 ft. Air compressor: 92-100 dBA, at source.	Increase in noise levels due to general construction activities. Welding: 77 dBA (avg.), Pneumatic tools: 90-116 dBA, operators position	Increased noise levels from dragline/backhoe equipment and marine traffic. Trenching: 88 dBA (Land average). Large tug, loaded: 54-55 dBA (with silencer) 140 dBA (without)	Intermittent noise associated with inspection and maintenance, primarily near shore for pipelines. Motorboat: an average of 80 dBA, 50 ft. Gas venting (blowdown):	Similar to noise levels of well completion (slightly increased and of shortened duration).

TABLE 2-14 (concluded)

SUMMARY OF ENVIRONMMENTAL LOADINGS AND GENERIC EFFECTS OF HYDROCARBON PRODUCTION IN ALABAMA AND MISSISSIPPI STATE WATERS OF THE GULF OF MEXICO

Parameter	Well Completion	Platform Construction	Gathering System Contruction	Normal Operations of Wells and Pipeline Gathering System	Well Workover
Solid Waste	Production of small amounts of cuttings and muds, mostly formation fluids with completion additives. Disposed of at an approved site.	No discernible impact	No discernible impact.	No discernible impact.	Production of drilling waste similar to exploratory drilling, including muds, cements, cuttings, and fracturing chemicals. Drilling fluids: 2,000 bbl/well. Disposed of at an approved site.
Socioeconomic Characteristics	Personnel increase; 28-51 on rig at once. More traffic at staging area. Additional tugs possibly needed; 2-4 jobs per vessel; local firm could be used.	20 people to prepare site. 80 workers (40 each shift) needed for installation. 40 or more to place equipment. Only a few jobs for locals if regional firm won contract. Traffic increase at staging area and retail purchases by workers to and from job. Local tugs could be used.	120 workers for 5-line offshore system, 60 in each tour; 10 could be local. Traffic increase at staging area; only minor purchases made by commuters. Right-of-way for landfall could result in a revenue influx, other effects are short term.	Average of 10 people needed to monitor platform equipment. Pipeline is mostly automated, small local crew could be used. Employment is long term. Wages would circulate locally. Severance taxes and royalties Shown in Tables 2-4 and 2-9 would be collected and benefit population and governments.	Same as initial drilling. 20-36 in a crew; little interaction with adjacent community. Operation would last at least several weeks.
Navigation	Increased waterway traffic (supply barge, crew boat); estimated maximum increase: 8 trips per day (2 barges, 6 crew boats).	Increased waterway traffic (derrick barge, supply barge, crew boat); estimated maximum increase (at start of platform installation): 8 to 9 trips per day (3 barges, 5 to 6 crew boats).	Potential navigation impact while trenching across Intracoastal Waterway; dredged material pile next to pipeline trench in shallow water areas near shore could block waterway traffic until trench is refilled.	Few potential effects expected.	Increased waterway traffic same as for routine operations during drilling.

[1]No discharges are allowed from platforms or drilling barges with the exception of uncontaminated bilge and ballast water; discharges from marine vessels are allowed in conformance with U.S. Coast Guard regulations.

TABLE 2-15

SUMMARY OF ENVIRONMENTAL LOADINGS AND GENERIC EFFECTS OF WELL FIELD ABANDONMENT IN ALABAMA AND MISSISSIPPI STATE WATERS OF THE GULF OF MEXICO

Parameter	Well Site	Pipelines
Water Quality	Sediment disruption from removing facilities. Sediment resuspension from backfilling access canals to original contours. Concomitant increase in turbidity and release of nutrients and oxygen-demanding organics. Sediment resuspension in shallow waters and engine exhaust discharges from supply/crew boats.	Possible sediment disruption from removing above ground structures. Pipelines remain in ground.
Hydrology	Local obstruction of tidal currents from moored barges and boats. Remaining shell pads could alter local navigation and fishing patterns.	Not affected.
Aquatic Ecosystem	Localized, short-term turbidity increase and benthic disturbance when production platform removed. Rapid recovery of small area disturbed. Remaining pad material would serve as substrate for oysters.	Pipeline abandoned in place. No environmental disturbance.
Wastewater Disposal	Sanitary wastes from personnel stored in tanks/barge and hauled to shore for processing and disposal or treated and discharged to Federal waters.	Flushing fluids collected at processing plant.

TABLE 2-15 (Continued)

SUMMARY OF ENVIRONMENTAL [illegible] GENERIC EFFECTS
WELL FIELD ABANDONMENT IN ALABAMA AND MISSISSIPPI
STATE WATERS OF THE GULF OF MEXICO

Parameter	Well Site	Pipelines
Groundwater	Possibility of improperly plugged well providing conduit for formation waters to flow to surface and impact shallow aquifers through infiltration, or loss directly from abandoned well to freshwater aquifer.	No discernible impact.
Air Emissions	Emissions from service vehicles. Emissions (in tons per year): TSP (.087), SO^2 (.063), CO (2.07), HC (.192) and NOX (.207).	
Noise	Noise level increase due to general construction activities: Welding: 77 dBA (average). Backhoe: 85 dBA, 50 ft.	Same as well sites but only applicable to above ground structures. Pipes remain in ground.
Solid Waste	Generation of general construction waste. Impact minimal. Disposed of at an approved site.	Same as well site for above ground structures. Pipes remain in ground.
Socioeconomic Characteristics	Termination of severance taxes collected by and distributed from the state. Crew size to remove platform about the same as in installation.	A small crew, possibly local labor, would flush and clean the line. Line abandoned in place.
Navigation	Increased waterway traffic for equipment removal; estimated maximum increase: 5 trips per day (2 barges, 3 crew boats).	Not affected.

TABLE 2-16

SUMMARY OF ENVIRONMENTAL LOADINGS AND GENERIC EFFECTS OF SPILLS OF WATERS OR RELEASE TO THE ATMOSPHERE OF NATURAL GAS CONTAINING H_2S IN ALABAMA AND MISSISSIPPI STATE WATERS OF THE GULF OF MEXICO

AGENT	EFFECT
	-DRILLING-
Spills	
Crude Oil	Low probability of encountering oil in formations under state waters of the Gulf of Mexico. Effects of a large uncontained spill if one occurred, would depend on wind direction, sea state, season and other factors at time of spill. Spill during winter and early spring spawning season could cause some mortality of eggs, larvae and juveniles. Weathering, evaporation and dilution would reduce toxic aromatic content. Residual tar balls could remain in sediments for up to a year and be transported onto beaches.
Fuel Oil	Typically 75,000 to 100,000 gallons in drilling rig storage tanks. 40,000 gallons in fuel transport barges. Effects of spill would be similar to crude oil spill.
Chemicals	Volumes spilled would be small. Effects would be negligible because of dilution.
Drilling Muds	Most material would sink to bottom at spill site. Turbid plume of small quantity of material would extend away from site. Material would be spread out by storm events. Effects would be localized. Ocean disposal of muds and fluids allowed from rigs beyond 3 mile limit of state waters.
Natural Gas Containing H_2S	Most gas would bubble to surface. Rapid dilution would minimize effects. Large crater could form at well site if casing has been breached below sediment surface. Extensive resuspension of sediments and redeposition around crater.
Atmospheric Release of Gas Containing H_2S	Same as Mobile Bay and Mississippi Sound.
Socioeconomic Characteristics	Tourism and recreation industries could be adversely affected. Alabama coast accounts for $625 million spent annually on tourism. Lodging and sports fishing in Mississippi is worth $183 million per annum. Economic losses would be likely if an accident occurred.
	-PRODUCTION-
Spills	
Well Servicing	Solvents and materials used in small volumes. Effects unlikely because of rapid dilution.
Pipeline Rupture	Could release crude oil (if discovered in region), natural gas containing hydrogen sulfide and/or corrosion inhibitor. Effects of release of crude oil or natural gas would be the same as in the drilling phase. Spill of corrosion inhibitor would be like the spill of a heavy crude oil.
Well Workover	Activities are similar to drilling phase. Spills would be similar to those described for drilling.
Pipeline Rupture Releasing Natural Gas Containing H_2S	Same as Mobile Bay and Mississippi Sound.
Socioeconomic Characteristics	Same as drilling.

AD-A152 060 EXPLORATION AND PRODUCTION OF HYDROCARBON RESOURCES IN COASTAL ALABAMA AND MISSISSIPPI EXECUTIVE SUMMARY(U) ARMY ENGINEER DISTRICT MOBILE AL NOV 84

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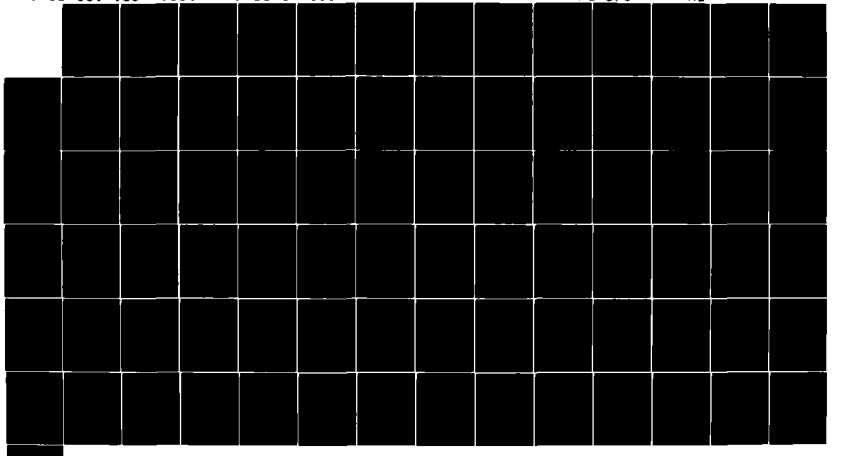

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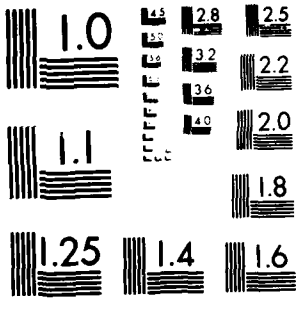


TABLE 2-17

SUMMARY OF ENVIRONMMINTAL LOADINGS AND GENERIC EFFECTS OF DRILLING FROM AN UPLAND SITE IN COASTAL ALABAMA AND MISSISSIPPI

Parameter	Site Preparation	Routine Operations
Water Quality and Hydrology	Runoff from spoil piles, drilling rigs and trenches may include sediment, waste fuels, waste oils chemicals.	
Upland Ecosystems	1/2 acre cleared per 1000 feet of access road; 1 acre cleared for drilling activities; in both areas, wildlife habitat would be lost for the life of the project.	No additional area disturbed.
Wastewater Disposal	Sanitary wastes would be stored, treated and discharged below ground, treated on-site and discharged to the nearest water body, or hauled to a treatment plant for treatment and disposal.	Drilling muds/fluids may be disposed of in lagoons or dewatered and transported to a landfill; in either case, liquid would need to be discharged to a water body or to a treatment plant.
Groundwater	Alteration of near surface hydrological process from earth moving activities.	Possible contamination of freshwater aquifer by exposure to drilling muds, formation waters or hydrocarbons through improperly sealed wells, casing ruptures, or natural fractures in aquicludes. Possible contamination of shallow aquifers due to use of on-site mud storage pits, or infiltration of brine for emergency brine storage pits if liner is breached.
Air Emissions	Emissions from drilling equipment, dredge equipment, miscellaneous construction activities and transportation. Includes rig activities during completion and workover. Emissions (in tons per year): TSP (13.47), SO2 (26.14), CO (163.21), HC (3.0) and NOX (390.1)	
Noise	Increase in noise levels due to land clearing activities and transportation. Dozer: 80 dBA, 50 ft. Chain saw: 83 dBA (avg.), 50 ft. Medium-heavy duty trucks: 84 dBA, 50 ft.	Increase in noise levels from operation of drilling equipment and support activities: Generic drill rig: 85 dBA, 100 ft. (level rig may be higher due to radiator fan noise).
Solid Waste	Biomass from land clearing disposed of on site or at an approved landfill.	Production of spent drilling muds and cuttings (per av. 21,000 ft. well): Liquids: 23,500-184,000 bbl. Cuttings: 6,000-9,000 bbl. Muds: 6,000-17,000 bbl. Disposed of at an approved site
Socioeconomic Characteristics	Land-based oil and gas infrastructure in region is currently developed, not a new activity. 15-30 workers to clear access and site, some local hires. 15-30 in all drilling shifts rig up. 8-16 truck drivers and helpers to transport rig. Traffic increases at access and site.	8-10 people for each of 3 8-hour shifts, fourth crew fills in as needed. Workers within a hundred miles would be likely to commute daily or stay during the week, not move. Small retail purchases made by commuters, residents' wages circulated locally.

TABLE 2-18
SUMMARY OF ENVIRONMENTAL LOADINGS AND GENERIC EFFECTS FR
OCCURRING ON UPLANDS IN COASTAL ALABAM

PARAMETER	UPLAND WELL COMPLETION	FACILITY CONSTRUCTION GATHERING SYSTEM	FACILITY CONSTRUCTION OIL TREATMENT FACILITY	FACILITY CONSTRUCTION GAS TREATMENT FACILITY	NORMAL OPERATION UPLAND GATHERING SYSTEM	NORMAL OPERATION TREATM
WATER QUALITY, HYDROLOGY AND WASTEWATER DISPOSAL	Sanitary wastes, runoff from site, production waters and mud liquids from drilling. Wastes stored onsite or piped to treatment plant for processing and disposal.	Runoff from trenches and spoil piles. Sanitary wastes from personnel stored onsite and hauled to treatment plant for processing and disposal.	Sediment runoff from site during construction. Sanitary wastes from personnel stored onsite and hauled to treatment plant for processing and disposal.	Sediment runoff from site during construction. Sanitary wastes from personnel stored on-site and hauled to treatment plant for processing and disposal.	Not applicable.	Sanita duced off, boiler may be surfa treatm NPDES into charge sewer dispos treatm unavoi occur.
UPLAND ECOSYSTEM	No additional area disturbed.	1 to 1 3/4 acres cleared per 1000 feet of right-of-way, and all wildlife habitat lost within this area.	Oil treatment: 15 to 20 acres cleared and wildlife habitat lost.	Gas treatment: 30 to 35 acres cleared (additional 20 acres could be needed for storage of recovered sulfur).	Regrowth of grasses and small shrubs. Continued maintenance would not allow regrowth of trees and large large woody shrubs.	Contin biolog produc struct pave life c
GROUNDWATER	Possible aquifer contamination from formation additives due to unintentional fracturing of and subsequent communication through aquicludes. Introduction of hydrocarbons and formation waters and additives by casing ruptures during fracturing efforts.	No discernible impact.	No discernible impact.	No discernible impact.	Accidents at treatment facilities and during transportation of product.	Acci facil transp duct.
AIR EMISSIONS	Emissions from service vehicles and drill rig at rates reduced from exploratory drilling and generally with a smaller rig. Temporary use of compressors and pumps. Emissions (in tons per year, not including rig) TSP (.044), SO2 (.032), CO (1.039), THC (.096), and NOX (.103).	Emissions from general construction equipment. Emissions (in tons per year): TSP (.146), SO2 (.106), CO (3.462), THC (.319), and NOX (.344).			Emissions from pumps, compressors vehicles and flaring. Emissions (in tons per year): TS (220.51), CO (207.46), THC (10.6 (143.34).	
NOISE	Increase in noise levels associated with operation of generally smaller drilling rig. Also noise from pumps, compressors, lifts, and vehicles. Air compressor: 92--100 dBA at source. Medium-heavy duty truck: 84 dBA 50 ft.	Increased noise levels from land clearing, construction and transportation activities. Dozer: 80 dBA, 50 ft. Paver: 89 dBA, 50 ft. Concrete mixer: 85 dBA, 50 ft. Pneumatic tools: 86 dBA, 50 ft. Land clearing: 75 dBA, (average). Medium-heavy duty truck: 84 dBA, 50 ft.			Intermittent noise associate wi and maintenance of pipelines, op treatment facilities/service bas portation of product by trucks. Flare stack: 81-96 dBA, 20 ft. Generator: 90 dBA, 5 ft. Pump: 80-90 dBA, operator's pos Air Compressor: 90-100 dBA a dBA Medium heavy-duty truck: ok: 8 Large tug with barge at doc	

TABLE 2-18

NON-[illegible] LOADINGS AND GENERIC EFFECTS FROM HYDROCARBON PRODUCTION ACTIVITIES [illegible] IN UPLANDS IN COASTAL ALABAMA AND MISSISSIPPI

FACT[illegible]	NORMAL OPERATION: UPLAND GATHERING SYSTEM	NORMAL OPERATION: TREATMENT FACILITY	UPLAND WELL WORKOVER	UPLAND ENHANCED RECOVERY FACILITIES	SERVICE BASES	RESOURCE TRANSPORT MARKET
[illegible]	Not applicable.	Sanitary wastes, produced brines, site runoff, cooling water, boiler water. Wastes may be discharged to surface waters after treatment required by NPDES permit, injected into deep wells, or discharged to a sanitary sewer for treatment and disposal at a municipal treatment plant. Small, unavoidable spills would occur.	Sanitary wastes from personnel, runoff from site production waters and mud liquids. Wastes stored on-site or piped to treatment plant for processing and disposal. Small, unavoidable spills would occur.	Sanitary wastes from personnel, runoff from site production waters and mud liquids. Wastes stored on-site or piped to treatment plant for processing and disposal. Small, unavoidable spills would occur.	Altered runoff characteristics wastewaters and unavoidable, small spills are generated.	Small, unavoidable spills would occur.
[illegible]	Regrowth of grasses and small shrubs; continued maintenance would not allow regrowth of trees and large large woody shrubs.	Continued loss biological productivity under structures and paved areas for life of project.	No additional area disturbed.	[illegible]: Wildlife habitat lost for new well (1 acre) and new pipeline (1 to 1 3/4 acres per [illegible] feet of line). Material injection: additional 3/4 acre may be cleared to store material to be injected.	No effect of existing facilities used; expansion or creation of new facilities could affect 50 to 100 acres depending on expected activity.	Pipeline: 1 to 1 3/4 acres cleared per 1000 feet of line, loss of wildlife habitat.
[illegible] Impa[illegible]	Accidents at treatment facilities and during transportation of product.	Accidents at treatment facilities and during transportation of product.	Same as exploratory drilling with generally reduced activities and the addition of formation additives.	Contamination from drilling new well. Over pressure and/or case rupture may cause loss of enhancement or formation fluids to a freshwater aquifer.	No discernible impact.	No discernible impact.
[illegible]	Emissions from pumps, compressors, transport vehicles and flaring. Emissions (in tons per year): TSP (2.143), SO2 (2.[illegible]), CO (207.467), THC (10.62), and NOX (43.34).		Emissions from service vehicles and a generally smaller workover rig as compared to exploratory drilling operating for only 3 to 8 months. Emissions (in tons per year, not including rig): TSP (.087), SO2 (.063), CO (2.088), THC (.192), and NOX (.208).	Emissions from pumps and compressors and associated transportation activities, assuming no new wells are drilled. Emissions (in tons per year): TSP (1.97), SO2 ([illegible].43), CO (4.674), THC ([illegible].43), and NOX (.465).		
[illegible]portation	Intermittent noise associated with inspection and maintenance of pipelines, operation of treatment facilities/service bases and transportation of product by truck. Flare stack: 81-96 dBA, 20 ft. Generator: 90 dBA, 6 ft. Pump: 80-90 dBA, operator's position. Air Compressor: 90-100 dBA [illegible] dBA, 50 ft. Medium heavy-duty truck: [illegible] 62 dBA [illegible]. Large tug with barge at 100[illegible]		Similar to increased noise from well completion, slightly increased and generally of a shortened duration (3 to 8 weeks).	Increased noise levels due to the use of compressors and pumps and service vehicles. Pump: 70 dBA, 50 ft. Air compressor: 92-100 dBA Medium heavy-duty truck: 84 dBa, 50 ft. No pump/compressor noise if pressurized gas is recycled (via pipes) from treatment plant.	Increased noise levels similar to those of normal operations of gathering systems and treatment facilities.	

TABLE 2-18 (Concluded)
SUMMARY OF ENVIRONMENTAL LOADINGS AND GENERIC EFFECTS FROM HYDROCARBON PRODUCTION OCCURRING ON UPLANDS IN COASTAL ALABAMA AND MISSISSIPPI

PARAMETER	FACILITY CONSTRUCTION				NORMAL OPERATION	
	UPLAND WELL COMPLETION	GATHERING SYSTEM	OIL TREATMENT FACILITY	GAS TREATMENT FACILITY	UPLAND GATHERING SYSTEM	TREATMENT FACILITY
SOLID WASTE	Production of small amounts of cuttings and muds, mostly formation fluids with completion additives. Disposed of at an approved site.	General construction waste.	General construction waste.	General construction waste.	No discernible impact.	Small volumes of sediment material produced from oil treatment tanks and piping. For a 225 MMCFD gas processing plant, one barrel per day of sulfinol process waste. Three to 5 tons/year of miscellaneous solid waste produced. Some of which may be classified hazardous if produced in sufficient quantities and not reclaimed. Small volumes of industrial waste produced at service bases.
SOCIOECONOMIC CHARACTERISTICS	One of busiest phases, workers on site at once would increase, as would traffic. Land-based service industry in region, so increases would be in line with established practices. Completion indicates that resources are available for taxation and royalties.	50 to 100 jobs. 35% to 60% could be local hires. Employment is transitory. Traffic increases at meeting points. Potential local purchases of materials. Land acquisition could result in monetary influx.	5 to 15 acres for plant; 50 acres could be acquired. Employment for 10 to 150; more than 1/2 could be local hires. Wages circulated and taxed. Possible immigration; larger communities could absorb addition with little if any stress on resources. Traffic increases at and around site.	20 to 75 acres acquired, more if larger buffer is needed. 25 to 550 workers; most could be local hires. All effects same as for oil processing plant.	Operation highly automated; small workforce needed for monitoring and right-of-way maintenance.	Permanent employment for 15-35 people. Wages locally circulated and taxed; as shown in Tables 2-4 and 2-9.

TABLE 2-18 (concluded)

POTENTIAL IMPACTS AND GENERIC EFFECTS FROM HYDROCARBON PRODUCTION ACTIVITIES
OCCURRING ON LANDS IN COASTAL ALABAMA AND MISSISSIPPI

FACILITY	NORMAL OPERATION: OFFLAND GATHERING SYSTEM	NORMAL OPERATION: TREATMENT FACILITY	UPLAND WELL WORKOVER	PLANNED ENHANCED RECOVERY FACILITIES	SERVICE BASES	RESOURCE TRANSPORT MARKET
...ation	No discernible impact.	Small volumes of sediment material produced from oil treatment tanks and piping. For a 225 MMCFD gas processing plant, one barrel per day of sulfinol process waste. Three to 5 tons/year of miscellaneous solid waste produced. Some of which may be classified hazardous if produced in sufficient quantities and not reclaimed. Small volumes of industrial waste produced at service bases.	Production of drilling waste similar to exploratory drilling, including muds, cements, cuttings, and fracturing chemicals. Drilling fluids: 2,000 bbl/well. Disposed of at an approved site.	No discernible impact, assuming no new wells are drilled.	Construction debris would be major form of solid waste during construction. Wastes from operations would include dunnage, 6.5 lbs. of garbage per person per day.	No discernible impact.
...ll ...s. All ...as for ...g plant.	operation highly automated; small workforce needed for monitoring and right-of-way maintenance.	Permanent employment for 15-35 people. Wages locally circulated and taxed; as shown in Tables 2-4 and 2-9.	Same as initial drilling operations.	If new pipeline needed same as initial pipeline. If new wells are needed same as initial drilling. Could expand treatment facility then small construction workforce needed. Effects short lived.	5 to 10 acres most used for open storage. Improvements could require workforce of 20 to 90. Space usually rented. 2 to over 50 people needed during operation; many local hires. Wages and taxes circulated locally.	If new pipeline is needed, employment opportunities would be the same as initial gathering system.

TABLE 2-19

SUMMARY ENVIRONMENTAL IMPACTS AND ESTHETIC EFFECTS OF ABANDONMENT OF UPLAND HYDROCARBON DRILLING AND PRODUCTION FACILITIES IN COASTAL ALABAMA AND MISSISSIPPI

Parameter	Upland Well Site	Pipelines	Treatment Facilities	Service Bases
Surface water resources	Surface runoff from decommissioning activities and waste chemicals from erosion and residual chemical/product contamination.	Pipelines remain in ground. Surface runoff and waste chemicals from decommissioning activities associated with above ground facilities.	Surface runoff and waste chemicals from decommissioning activities including erosion and residual chemical product contamination.	
Plant ecosystems	After equipment removal, area could be regarded and reseeded, as determined by landowner.	Future use of area determined by landowner.	Future use of area determined by landowner	Area would probably remain as a commercial or industrial area
Wastewater disposal	Sanitary wastes from personnel treated and discharged on site or hauled to treatment plant for processing and disposal.	Flushing fluids collected, treated, and disposed of at processing facility.	Sanitary wastes from personnel may be treated and discharged to surface waters or hauled or piped to municipal treatment plant for treatment and and disposal. Pipeline flushing fluids either treated and disposed of to deep-well injection or surface waters, or hauled or piped to industrial treatment plant for treatment and disposal.	
Groundwater	Possibility of improperly plugged well providing conduit for formation waters to flow to surface and impact shallow aquifers through infiltration, or loss directly from abandoned well to freshwater aquifer	No discernible impact.	No discernible impact.	No discernible impact.
Air Emissions	Emissions from service vehicles. Emissions (in tons per year): TSP (.003), SO2 (.006), CO (.05), HC (.008) and NOX (.004).			
Noise	Noise level increase similar to general construction activities: Welding: 77 dBA (average) Backhoe: 85 dBA, 50 ft.	Same as well sites but only applicable to above ground structures. Pipes remain in ground.	Similar to well site (more activity) if facility is not sold in place.	Similar to well site if facility is not sold in place.
Solid Waste	Generation of general construction waste. Impact minimal. Disposed of at an approved site.	Same as well site for above ground structures. Pipes remain in ground.	Similar to well site (more activity) if facility is not sold in place.	Similar to well site if facility is not sold in place.
Socio-economic Characteristics	Minimum 5-7 days to move rig off site. At least 26 people employed. Traffic would increase. Cessation of severance tax and royalties to state and/or private parties.	Small crew needed to flush pipes; no appreciable effects.	Facilities could be sold for similar use, converted to another industrial use, or be removed. New use could be beneficial for local employment.	Could be converted and used in marine transportation, commercial or sport fishing, fish or wood processing or industrial park. Substituting business may or may not affect local employment, personal income taxes and local resources.

TABLE 2-20
SUMMARY OF ENVIRONMENTAL EFFECTS OF RESOURCE

PARAMETER	MOBILE DELTA	MOBILE BAY	MISSISSIPPI SOUND
WATER QUALITY	Cumulative effects of turbidity unlikely because of temporal and spacial separation of activities. All wastewaters and solid wastes collected and transported to land for disposal.	Cumulative effects of turbidity unlikely because of temporal and spacial separation of activities. All wastewaters and solid wastes collected and transported to land for disposal.	Cumulative effects of turbidity unli... because of temporal and spacial sepa... of activities. All wastewaters and ... wastes collected and transported to ... for disposal.
HYDROLOGY	No cumulative effect if separate waterways are not connected.	No cumulative effects	No cumulative effects.
GROUNDWATER			
WASTEWATER DISPOSAL	All sanitary wastewater from well sites collected and transported to shore for disposal. Volume generated would be 17, 19 and 24 million gallons for the low, moderate and high scenarios; small volume compared to amount generated in surrounding region.	All sanitary and wastewater from well sites collected and transported to shore for disposal. Volume generated would be 180, 230 and 170 million gallons for the low, moderate and high scenarios; small volume compared to amount generated in surrounding region.	All sanitary and wastewater from we... collected and transported to shore ... disposal. Volume generated would b... and 60 million gallons for the low, ... and high scenarios; small volume com... to amount generated in surrounding ...
NOISE	Noise levels generated by multiple drilling rigs spaced a minimum distance apart are not appreciably noisier than one drilling rig relative to an equidistant sensitive receptor (Mobile River Delta) or an offshore receptor (Mobile Bay, Mississippi Sound, Gulf of Mexico). Maximum cumulative noise levels for drilling rig operations under the worst case would be 65 to 70 dBA.	Maximum cumulative noise levels for drilling rig construction and normal operations under the worst case would be 58 to 59 dBA.	Maximum cumulative noise levels for drilling rig construction and normal operations under the worst case wou... be 58 to 59 dBA.
WETLAND ECOSYSTEMS	Total forested Delta area altered would range from 205 to 510 acres depending on the combination of drilling alternative and scenario; area required for pipeline right-of-way would be similar for all scenarios and would be a significant portion of total area affected in all scenarios, decreasing from 255 acres for the low scenario to 185 acres for the high scenario; area affected by drilling would vary greatly depending on the drilling alternative used; platforms and trestle roads would only alter 15 to 30 acres, canals and slips would alter 155 to 325 acres. Use of canals and slips would eliminate primary production, detritus export and the use of the area for spawning and feeding; area altered by platforms, trestle roads and pipeline rights-of-way would have reduced primary production but the area would still be available as feeding and spawning habitat. Altered area would be less than 1 percent of forested Delta area but would be an incremental increase to the 1.7 percent already altered (excluding logging). Total non-forested Delta area altered would range from 11 to 50 acres, much of it pipeline right-of-way; pipeline area would be disturbed only temporarily since careful restoration would allow recovery of original vegetation; use of platforms and trestle roads would alter about 1 acre; canals and slips would alter 5 to 22 acres. While the total area affected would be small, it would be an incremental addition to the already large loss of non-forested Delta area (about 25 percent) that has already occurred.	Wetlands would probably not be disturbed under any scenario because adequate pipeline landfalls exist that would not require crossing wetlands; forested wetlands would be crossed between Weeks Bay and the Bon Secour River, a likely maximum of 3 corridors would disturb 1 percent of the wetland area.	only 3 wetland areas could not be ... by directional drilling; limited ... bon resource estimated for region ... low probability of drilling these ... Most pipelines in the region would ... onshore between Pascagoula and the ... Island Bridge; careful planning of ... could minimize or avoid crossing wet...

TABLE 2-20
SUMMARY OF ENVIRONMENTAL EFFECTS OF RESOURCE DEVELOPMENT SCENARIOS

	MISSISSIPPI SOUND	STATE WATERS OF THE GULF OF MEXICO	UPLAND
... ...	...umulative effects of turbidity unlikely because of temporal and spacial separation of activities. All wastewaters and solid wastes collected and transported to land for disposal.	Cumulative effects of turbidity unlikely because of temporal and spacial separation of activities. All wastewaters and solid wastes collected and transported to land for disposal.	Not applicable.
	No cumulative effects.	No cumulative effect.	Not applicable.
...sites ...dis- ...low moderate ...ated ...gion.	All sanitary and wastewater from well sites collected and transported to shore for disposal. Volume generated would be 30, 60 and 60 million gallons for the low, moderate and high scenarios; small volume compared to amount generated in surrounding region.	All sanitary wastewater from well sites collected and transported to shore for disposal. Volume generated would be 17, 19 and 24 million gallons for the low, moderate and high scenarios; small volume compared to amount generated in surrounding region.	
	Maximum cumulative noise levels for drilling rig construction and normal operations under the worst case would be 58 to 59 dBA.	Maximum cumulative noise levels for drilling construction and normal operations under the worst case would be 48 dBA.	The USEPA recommended values for residential/institutional areas are 55 to 65 dBA (L_{dn}). However, those activities that are continuous (e.g., drilling) would produce a noise level higher (L_{dn}) than the presented calculated instantaneous estimates. Other factors than can increase or decrease estimates include vegetation, atmospheric inversions, wind and ambient noise levels.
...ber ...ot ...et- Bay ...ximum ...t of	...only 3 wetland areas could not be reached by directional drilling; limited hydrocarbon resource estimated for region gives low probability of drilling these areas. Most pipelines in the region would come onshore between Pascagoula and the Dauphin Island Bridge; careful planning of routes could minimize or avoid crossing wetlands.	Not applicable.	Not applicable.

TABLE 2-20 (Continued)
SUMMARY OF ENVIRONMENTAL EFFECTS OF RFD - 5

PARAMETER	MOBILE DELTA	MOBILE BAY	MISSISSIPPI SOUND
AQUATIC ECOSYSTEMS	Little cumulative affect in main flow channels because of likely spacial and temporal separation of dredging activities for canal construction or pipeline river crossings if these methods are used; virtually no effect if boring method used for pipeline river crossings and platform drilling methods are employed. Dredging activities in shallow bays of southern Delta would occur in an area of importance as a nursery for many aquatic organisms and as waterfowl over-wintering ground. Aquatic habitat created in canals and slips would add only slightly to the 30,000 acres of aquatic habitat in the Delta. The value of this habitat is not documented but could be low if low dissolved oxygen concentrations occur.	Main altering activity would be pipeline construction during years 6 to 10 or 11. Area affected by drilling sites would be very small for any drilling alternative or scenarios. Under the high and moderate scenarios, between 2300 to 2500 acres would be newly disturbed or recovering from disturbance in years 9 and 10, which is about 1 percent of the bay area; some affect on bay secondary productivity could result for that period if the disturbed area is concentrated in one portion of the bay. Dredging for well site access would probably be necessary in the shallow northern portion of the bay near the Battleship Parkway; any disturbance there would occur in an area of importance as a nursery for many species and as a waterfowl over-wintering ground.	Very little activity would occur [illegible] scenario; much of what would occur [illegible] concentrated in eastern portions [illegible] sound. Most pipeline construction would occur in 1 or 2 years. Guidelines [illegible] Mississippi to not allow drilling [illegible] or pipelines in or near seagrass [illegible] or oyster reefs, so such guidelines [illegible] Alabama waters, but most seagrass [illegible] are within 1/2 mile of south, west [illegible] drilling sites are expected. Any [illegible] bance by dredging in the [illegible] of Portersville Bay and near the [illegible] Island Bridge could affect [illegible] grounds and oyster bottoms.
COMMERCIAL FISHERIES	Minimal impacts expected.	Direct loss of 10 to 15 acres to any fishing; trawling operations restricted on another 50 to 100 acres; bottom irregularities or mud lumps following *gathering line* installation could restrict fishing boat movements or trawling activities.	Direct loss of 1 1/2 to [illegible] acres [illegible] fishing; trawling operations restricted on another 8 to 30 acres; purse [illegible] operations potentially restricted [illegible] 160 acres near rig or platform; [illegible] irregularities or mud lumps following gathering line installation could restrict fishing boat movements or trawling activities.
NAVIGATION	Estimated potential maximums of daily waterway traffic increases 5 to 6 barges, 15 to 30 crew boats/supply boats.	Estimated potential maximums of daily waterway traffic increases: 30 to 45 barges, 55 to 95 crew boats/supply boats; 12 to 15 platforms added as permanent structures in the Bay.	Estimated potential maximums of daily waterway traffic increases: 5 to [illegible] barges, 10 to 40 crew boats/supply boats; 2 to 5 platforms added as permanent structures in the Sound.
CULTURAL RESOURCES	Prior to issuing any permit for major development activities, potential impacts to known or suspected cultural resources must be resolved.	Prior to issuing any permit for major development activities, potential impacts to known or suspected cultural resources must be resolved.	Prior to issuing any permit for major development activities, potential impacts to known or suspected cultural resources must be resolved.

TABLE 2-20 (Concluded)
SUMMARY OF ENVIRONMENTAL EFFECTS OF RESOURCE DEVELOPMENT SCENARIO

	MISSISSIPPI SOUND	ALABAMA WATERS	GULF OF MEXICO	UPLAND
[illegible]	Very little activity would occur under this scenario; much of what would occur may be concentrated in eastern portions of the Sound. Most pipeline construction would occur in 1 or 2 years. Guidelines in Mississippi do not allow drilling sites or pipelines in or near seagrass beds or oyster reefs; no such guidelines in Alabama waters, but most seagrass beds are within 1/2 mile of shore, within which drilling sites are excluded. Any disturbance by dredging in the shallow areas of Portersville Bay and near the Dauphin Island Bridge could affect shrimp nursery grounds and oyster bottoms.	Main [illegible] activity would be pipeline construction which would occur mostly in Alabama waters; activities would spread over years at [illegible] high and moderate scenarios, with very little activity under low scenarios. Benthic disturbance not likely to be significant for area as a whole. Concentration of construction activities in the vicinity of the inlet to Mobile Bay and near Petit Bois Pass, where most pipelines to shore are likely to enter estuarine waters, could cause some short-term loss of biological productivity in those areas during the most active years of construction. Use of common trunklines to shore from both state and Federal waters could reduce the benthic area disturbed.		Not applicable
[illegible] fishing	Direct loss of 1 1/2 to 5 acres to any fishing; trawling operations restricted on another 8 to 35 acres; purse seining operations potentially restricted on 160 acres near rig or platform; bottom irregularities or mud lumps following gathering line installation could restrict fishing boat movements or trawling activities.	Direct loss of 2 to 8 acres to any fishing; trawling operations restricted on another 10 to 55 acres; purse seining operations potentially restricted on 160 acres near rig or platform.		Not applicable.
[illegible] ily 45 boats; ent	Estimated potential maximums of daily waterway traffic increases: 5 to 20 barges, 10 to 40 crew boats/supply boats; 2 to 5 platforms added as permanent structures in the Sound.	Estimated potential maximums of daily waterway traffic increases: 5 to 25 barges, 15 to 50 crew boats/supply boats; 3 to 8 platforms added as permanent structures in the state waters.		Not applicable.
[illegible] or de- pacts to ces must	Prior to issuing any permit for major development activities, potential impacts to known or suspected cultural resources must be resolved.	Prior to issuing any permit for major development activities, potential impacts to known or suspected cultural resources must be resolved.		Prior to issuing any permit for major development activities, potential impacts to known or suspected cultural resources must be resolved; some secondary development (e.g., upgrading or building a service could potentially affect cultural resources in the area of development. Prior to issuing any project permit, conflicts on potential impacts to known or suspected cultural resources must be resolved.

TABLE [illegible]

SUMMARY OF [illegible] IMPACTS [illegible]
REFINEMENTS BASIS FOR [illegible] [illegible] [illegible]

PARAMETER	EFFECT
Air Emissions	There are greater total emissions from unit offshore operations due to added support and supply requirements, difference is small from Mobile River Delta to Alabama OCS, less than 10 percent. The scenarios reveal that peak level platform activities produce downwind concentrations of greater than de minimis levels (NOX, possibly SO2 and ISP). This was true in all project geographical areas. Peak level compaction processing plant capacity also produces downwind concentrations greater than de minimis levels [illegible]. This was true in all project geographical areas. Peak level platform and processing plant activity reach or exceed significant emission rates (NOX, CO, SO2). Peak level platform and processing plant emissions will consume 50 percent of Class II increment for SO2 out to 7 km distance. Long-term modeling reveals few excesses of air quality standards; these excesses are most likely associated with potential processing plants (SO2) (close in) and close to platform (within 5-10 km) emission centers (only close in to activity), but this does not include ambient. Background suggests possible potential problems where near non-attainment exists and where 50 percent of Class II increments are now committed. Continuance of proper PSD reviews of new sources will minimize this impact.

TABLE 2-2[illegible] (Continued)

SUMMARY OF ENVIRONMENTAL EFFECTS OF ACTIVITIES ANALYZED ON A REGION-WIDE BASIS FOR THE RESOURCE DEVELOPMENT SCENARIOS

PARAMETER	EFFECT
Air Emissions (Continued)	Class I areas are not affected; they are too distant from the activity. With actual ambient concentrations added to the picture, a few adjustments will likely have to be made in emissions in and near already burdened areas (by pollutant).
Groundwater	Multiple intrusions of a single aquifer pose the greatest threat to a groundwater contamination by chloride from brine disposal. Brine production for the highest resource development scenario (Mobile River Delta and Mobile Bay, 927.5 x 10^6 bbl) can be disposed of in approximately three square miles of the Wilcox Sand formation. Possible long-term contamination of fresh water aqui- fiers due to the characteristically slow discharge of pollutants by natural flushing.
Solid and Hazardous Waste	Onshore disposal of drilling muds, fluids and cuttings produced by multiple exploration and well workover drilling operations. The high resource development scenario for the entire project area will produce approximately 160,000 cubic yards of material in the most active year. A single permitted mud disposal operation in Mississippi is known to have an on-site capacity to dispose of approximately 1.38 x 10^6 cubic yards of material. Production of hazardous waste sludges from multiple gas treatment plants would result. Less than two barrels per day of semisolid hazardous waste would be produced by the high resource development scenario.

[illegible]

[illegible] is for Intelligence Perspective and [illegible] Chapter from the DIS (Chapter 3).

TABLE 10-3 (Continued)

MITIGATING MEASURES RELEVANT TO OIL AND GAS DEVELOPMENT IN COASTAL ALABAMA AND MISSISSIPPI

CATEGORY	REGULATORY REQUIREMENTS	INDUSTRY PRACTICES	OTHER POTENTIAL MITIGATING MEASURES
[illegible]	Cultural resources survey required for major activities prior to start of activities (includes normal survey techniques on land and multi-sensor techniques underwater).		Require cultural resources survey for all portions of land-based support activity.
OIL SPILLS AND BLOWOUTS	National and regional accident contingency. Separate spill prevention control and countermeasures (SPCC) plans for above-ground exploration, drilling, production and abandonment. Local SPCC plans for Mobile River Delta, Mobile Bay, Mississippi Sound and Gulf of Mexico. Coordination of accident response team. State emergency response activities. Accident compensation funds. Designation of lead agency for accident response. Regulation of well control. Separate emergency action plans developed by companies. Designate preferred accident response techniques.	Multi-company cooperative for Gulf Coast. Measures to retain well control. Gulf of Mexico Marine Industry Research Group. Spill cleanup contractors. Specified facilities operation and emergency shutdown procedures. Containment booms at end of canal. Response and clean up unit is located in Bayou La Batre, Alabama.	Full-scale accident response center at Mobile and perhaps other locations. Multi-company cooperative(s) for the project area. Burial of pipelines 5 to 6 feet below sediment-water interface in open waters. Containment booms around barges when wastes are being transferred. Frequent pipeline inspection to detect damage and leaks augmented by automatic detection devices.

TABLE 10-1 (Continued)

MITIGATING MEASURES RELEVANT TO OIL AND GAS DEVELOPMENT IN COASTAL ALABAMA AND MISSISSIPPI

CATEGORY	REGULATORY REQUIREMENTS	INDUSTRY PRACTICES	OTHER POTENTIAL MITIGATION MEASURES
Accident situations	Federal Regulations and Policy Relevant to Accidents on OCS: Operators on OCS required to submit oil spill contingency plans. EPA and U.S. Coast Guard are enforcing agencies for spill containment and clean up and coordination of Regional Response Teams and on scene coordinators for regional cleanups. Pollution compensation - States can be reimbursed for reasonable cleanup costs by federal government.	Operators are members of Clean Gulf Associates. Response and clean up unit is located in Bayou La Batre, Alabama.	
Public Revenues	State Policy or Regulations: Operators must file a bond against the event of accidents to the state oil and gas board prior to drilling activities.		Compensation funds similar to federal plans could be established at state levels to offset potential economic losses to commercial fishing and tourism sectors in the event of an accident. Funds from hydrocarbon taxation could be the principal source of revenues.
Commercial Fishing	Compensation for commercial fisherman depending on circumstances of accident.		
Recreation/Tourism	Emergency Action Plans, including evacuation procedures must be submitted by operators for wells or plants producing resources with hydrogen sulfide gas. This would include tourist populations during peak seasons.		
NAVIGATION	Federally established safety fairways and designated anchorage areas; required aids to navigation (markers, lights, fog signals) for rigs, wellhead, platforms, pipe laying; publicaton in local notice to mariners of new rig or structure locations (includes type of aids to navigation).	Use of chase boat with geophysical surveys; crew changes scheduled for mid-week to avoid heavier weekend traffic.	

TABLE 10-1 (Continued)

MITIGATING MEASURES RELEVANT TO OIL AND GAS DEVELOPMENT IN COASTAL ALABAMA AND MISSISSIPPI

CATEGORY	REGULATORY REQUIREMENTS	INDUSTRY PRACTICES	OTHER POTENTIAL MITIGATION MEASURES
SOCIOECONOMIC CONCERNS			
Routine operations			
Effects from OCS	Federal Regulations and Policy: To prevent or mitigate effects from OCS development, planning grants and credit assistance can be granted under the Coastal Zone Management Act.		
Transportation of hydrocarbon resources from OCS	Intergovernmental Planning Program coordinates federal and state transportation (i.e., pipeline) needs and concerns.		
Recreation/Tourism	State Policy or Regulations to Reserve Coastal Resources: Protection of public coastal access. Protection of water recreation resources. Protection of natural scenic quality.	Offshore platforms enhance recreational fishing.	
Land Use	Special Management Areas designated for planning purposes. Energy facility siting procedures to resolve potential coastal land use conflicts. Hearings required when processing plant is proposed.		
Employment potentially leading to inmigration		Inmigration could be reduced by expanding industry practice of hiring locals when possible.	In the event of inmigration from employment opportunities, state revenues from severance taxes and royalties could be allocated specifically to community improvements in potentially affected areas.

TABLE 10-1 (Continued)

MITIGATING MEASURES RELEVANT TO OIL AND GAS DEVELOPMENT IN COASTAL ALABAMA AND MISSISSIPPI

CATEGORY	REGULATORY REQUIREMENTS	INDUSTRY PRACTICES	OTHER POTENTIAL MITIGATION MEASURES
SOLID WASTE DISPOSAL			
Geophysical exploration	Shot holes and other core holes below freshwater strata must be plugged.	Use of thumper trucks on uplands would reduce the use of shot holes	Use of aquatic exploration wherever possible.
Land clearing for access operations processing and service facilities	All potentially hazardous debris and vegetation must be out of well, tank and pump station vicinity. Approved offsite disposal of such waste is available. Open burning of solid wastes is prohibited.	Use of existing waterways in wetlands when possible.	Timber may be sold versus disposal offsite.
Drilling muds, cement, cuttings, sand, and other solid wastes generated by exploration, production, and workover	Zero discharge rules prohibit release of wastes from well sites into water; they must be collected, treated and disposed of in approved onshore facilities. All production facilities must be maintained to prevent pollution. Solid waste facilities must meet design and siting criteria, obtain construction and operations permits, follow monitoring and testing procedures. New drilling wastes are tested prior to disposal permitting.	Wastes containing marketable materials are treated for material reclamation and reuse.	Receptacle specifications could be mandated for waste barges, reducing risks of spills or leaks. Alternative procedures for drilling waste disposal could be used more widely i.e., landfarming, dewatering procedures or incorporating the material into soils as conditioners. A licensing or manifest system for transport of wastes from the drilling site to an approved disposal site could be developed.
Wastes from abandonment	Abandonment procedures specify plugging and severing casing and pilings thus eliminating solid waste at the drill site.	Economics encourages recovery and reuse of materials, vessels and equipment. Unusable materials are sold in place to salvage dealers.	
Waste and by-products from processing and treatment facilities	Federal Resource Conservation and Recovery Act, if applicable, and state solid waste management regulations.	Industry encourages efficient operation of recovery collection and processing facilities.	If some potentially hazardous wastes are generated in sufficient quantity, they might be considered hazardous; if storage, transport and disposal requirements established under RCRA were used when handling these wastes, the quality of the environment and public safety could be better insured.

TABLE 10-1 (Continued)

MITIGATING MEASURES RELEVANT TO OIL AND GAS DEVELOPMENT IN COASTAL ALABAMA AND MISSISSIPPI

CATEGORY	REGULATORY REQUIREMENTS	INDUSTRY PRACTICES	OTHER POTENTIAL MITIGATION MEASURES
Pipeline sites	Noise Control Act of 1972 AL Marine Police Regulations	Use of marine mufflers and enclosures; probably no nighttime construction.	Improved noise insulating materials and below-deck engine noise control.
Service bases/refineries	Noise control Act of 1972 AL Marine Police Regulations AL Noise Control Laws USEPA noise recommendations OSHA regulations Possible city ordinances	Use of mufflers and enclosures; probably no (or reduced) nighttime activity.	Improved noise insulating materials.
Normal operation drilling rigs	Noise Control Act of 1972 AL Marine Police Regulations Individual oil and gas leased tract contractual specifics USEPA noise recommendations OSHA regulations Possible city regulations	Use of mufflers and enclosures (e.g., rig noise abatement); use of electric cranes and heat exchange engines; recycling of pressurized gas from treatment plant for enhanced recovery (as opposed to on-site pumps).	Improved noise insulating materials; possible aesthetic shielding near onshore side of drilling rig or the receptor side(s) of land rig.
Pipelines	Noise Control Act of 1972 AL Noise Control laws AL Marine Police Regulations USEPA noise recommendations Possible city ordinances	Use of mufflers, enclosures and possibly silencers; reduced number of compressor stations (offshore)	Improved noise insulating materials and silencers.
Service bases	Noise Control Act of 1972 AL Marine Police Regulations AL Noise Control Laws USEPA noise recommendations OSHA regulations Possible city ordinances	Use of mufflers and enclosures; probably reduced activity during nighttime.	Improved noise insulating materials.
Gas plants partial processing	Noise Control Act of 1972 AL Noise Control Laws USEPA noise recommendations OSHA regulations Possible city ordinances	Multiport injector systems, mufflers enclosures, baffles, and absorbers.	Improved control technology. Use or greater use of vegetation to buffer noise.

TABLE 10-1 (Continued)

MITIGATING MEASURES RELEVANT TO OIL AND GAS DEVELOPMENT IN COASTAL ALABAMA AND MISSISSIPPI

CATEGORY	REGULATORY REQUIREMENTS	INDUSTRY PRACTICES	OTHER POTENTIAL MITIGATIVE MEASURES
Oil and gas vapors	New source performance standards, 40 CFR 60 Part K and Ka Storage of Liquids-Oil and Gas	Limited storage at sea; pipeline to shore	Recovery caps on venting storage tanks
Construction debris	Local "litter" laws; waste disposal limitations; city and county ordinances, permitting required for destruction or removal	Burning debris under permit; enhanced burning techniques through blowers	Bury in landfills, possibly [illegible] at sea under permit
Transportation	FAA and Federal Highway Administrative procedures; vehicular emissions, 40 CFR 86.081, 40 CFR 85.075-9 through 27, 40 CFR 86.1301-84 subpart N	Catalytic converters; filters; operate in daytime if possible	Purified fuel (no-lead, removal of additives; microprocessor controlled fuel flow, more efficient combustion
Peak oil and gas construction activity	Activities usually permitted under Federal and state laws	Limit to needs and economic demands	Delay or space at a more feasible schedule
Accidential release of pollutants	Mississippi State Oil and Gas Board, Rules of Procedure and Statewide Rules, 1982; Alabama State Oil and Gas Board, 1983; procedural recommendations or various Canadian studies	File emergency plan and procedures; requires protocol listing of who and how notified; evacuation procedures; warnings and alerts; liaison with fire, police, health authorities and methodology for accomplishing same; use warning and detection systems	Provide semi- or completely automatic monitoring and warning system over area in use; use dial-up technology to alert participating safety personnel at agencies; chemically combine with an inerting gas
NOISE			
Drilling sites	Noise Control Act of 1972 AL Marine Police Regulations AL Noise Control Laws Individual oil and gas leased tract contractural specifics. USEPA recommendations: L_{dn} = 55 to 65 dBA (residential) $L_{eq}(24)$ = 70 dBA (industrial) Possible city ordinances.	Use of mufflers and enclosures; restriction of some equipment use to daylight hours; possible use of electric cranes.	Improved noise insulating materials

TABLE 10-1 (Continued)

MITIGATING MEASURES RELEVANT TO OIL AND GAS DEVELOPMENT IN COASTAL ALABAMA AND MISSISSIPPI

CATEGORY	REGULATORY REQUIREMENTS	INDUSTRY PRACTICES	OTHER POTENTIAL MITIGATION MEASURES
AIR QUALITY			
Source emissions	40 CFR 61 Appendix A-Testing; new source performance standards, 40 CFR 60; requires best available control technology (BACT); AEROS, NEDS, SOTDAT, EMIS, WSAP, PREMOD (all part of EPA's information retrieval system). January 20, 1984 proposed Federal regulations would limit volatile organic compounds leaks from on-shore gas processing plants; same proposed regulations would put sulfur dioxide emissions limits gas processing facility and require "best demonstrated technology" to be employed	Design equipment sources to minimize emissions; design to least available emission rate	Place precipitators, scrubbers bag houses, filters or other conventional devices on end of source process or process to remove additional emissions
Ambient air quality standards	Ambient air quality standards, 40 CFR 50, state air quality standards Alabama (Alabama Law-Act 769 H.702), Mississippi, Florida state implementation plans, 40 CFR 51, citizen's suits allowable, 40 CFR 54; state air quality designations, 40 CFR 81	Required to model to predict compliance or degree of same (40 CFR 52.21)	Further reduce by added emission controls as stated above
PSD increments	PSD regulations, 40 CFR 51.24 and 52.21 June 1978; visibility, 40 CFR 51 Part P 51.302; non-compliance penalties, 40 CFR 67	Required to model or monitor to demonstrate compliance (40 CFR 52.21, 40 CFR 51)	Reduce emissions below PSD threshholds; monitor to show impact is de minimis
Attainment/non-attainment ambient standards	Attainment, 40 CFR Appendix S; delayed compliance orders, 40 CFR 65-66	Required to demonstrate attainment by 2 years of ambient data or 1 year and supportive modeling	Reduce emissions by closing down peripheral sources not part of this operation
Construction and operation practice			
Fugitive dust	Indirect sources, 40 CFR 52.22 (b)	Water sprays; fogging of dust producing sources or roads	Use of surfactants, calcium chloride on roads and storage piles

TABLE 10-1 (Continued)

MITIGATING MEASURES RELEVANT TO OIL AND GAS DEVELOPMENT IN COASTAL ALABAMA AND MISSISSIPPI

CATEGORY	REGULATORY REQUIREMENTS	INDUSTRY PRACTICES	OTHER POTENTIAL MITIGATIVE MEASURES
Blowouts or casing ruptures	General rules: AL Rule 400-1-3-.04 and 400-3-x-.02, MS Rule 63 and 13.	Installation of multiple blowout preventers; use of warning devices such as kick indicators.	Use of stronger alloys in casings to inhibit corrosion or rupture.
Spills	Federal Clean Water Act; containment of leaks or dikes: MS Rule 61	Collection of leakage or spills by curbing or dikes; zero discharge procedures; monitoring pipelines for corrosion.	Use of corrosion resistant alloys or liners in pipes and transport equipment.
Infiltration from earthern pits	Regulations for pit usage and construction to prevent groundwater contamination: AL Rule 400-1-5-.03, MS Rule 63.	Use of collection tanks rather than pits for most applications in project area.	Use of spray application of liners to reduce construction time and eliminate seams; Require liners for all pits.
Improper well plugging	Procedures stipulated to ensure protection of groundwater resources: AL Rule 400-1-3-.05, MS Rules 28 and 29. Plugging witnessed by state inspectors.	Regulated well plugging procedures.	
Contamination through fractures	General Federal and state rules for the protection of groundwater; specific requirements for fracturing to protect formations and aquifers: AL Rule 400-1-3-.14.	Geologic surveys to assess fracture/fault zones; computer assisted fracturing operations to predict results and control operations.	Using polymeric compounds to aid in the control of fracturing.
Underground injection	General regulations and standards of Federal UIC Program to protect underground sources of drinking water; specific rules governing injection well construction, injection procedures, designation procedures, designation procedures, designation of allowable injection strata; periodic state inspections of injection well mechanical integrity: AL Rule 400-1-5-.04, MS Rules 45 and 63.	Comply with existing regulations and requirements.	Use better measuring and evaluating techniques to determine formation characteristics; monitoring of aquifers to detect early stages of pollution; use of polymeric compounds to decrease volume of produced water.

TABLE 10-1 (Continued)

MITIGATING MEASURES RELEVANT TO OIL AND GAS DEVELOPMENT IN COASTAL ALABAMA AND MISSISSIPPI

CATEGORY	REGULATORY REQUIREMENTS	INDUSTRY PRACTICES	OTHER POTENTIAL MITIGATION MEASURES
WETLAND ECOSYSTEMS	Environmental review of permit applications by federal and state agencies. No pollutant discharge requirement. Spill contingency plans. Restoration of canals, slips and pipeline right-of-way.	Directional drilling to reduce drilling sites needed.	In the Mobile Delta, reduce wetland area affected by using alternatives to the canal and slip drilling method, narrow pipeline corridors and joint ventures and trunklining to reduce number of pipelines required. Use directional drilling to reach areas under saltmarshes to the extent practical. In Mobile Bay and Mississippi Sound avoid pipeline landfalls that cross wetlands; use narrow pipeline corridors; reduce the number of pipelines coming onshore by using joint ventures and trunklining.
UPLAND ECOSYSTEMS	Local zoning and land use stipulations. Requirement to consider prime farmland.	Erosion prevention practices. Restoration of drilling, well and treatment facility sites after abandonment.	Joint ventures to reduce area required for pipelines and treatment facilities.
THREATENED AND ENDANGERED SPECIES	Requirement to consider effects of activities. Agency coordination with Federal Office of Endangered Species.	Site surveys for presence of endangered species.	Alter project plans to avoid effects on endangered species. Increase spill prevention and control activities.
COMMERCIAL FISHERIES	Use of air gun rather than dynamite for geophysical exploration; required aids to navigation (see navigation category) on new structures.	When possible, establish boat schedules to avoid fishing fleet traffic.	No operations in oyster reef areas; avoid grass beds; establish pipeline corridors to minimize fisheries impacts.
GROUNDWATER			
Loss of formation waters or hydrocarbons to aquifers	Alabama casing/cementing requirements: Rules 400-1-3-.03, 400-3-x-.02; prevention of interstrata movement: Rule 400-1-3-.04; Mississippi casing/cementing requirements: Rules 11, 12 and OS-4; prevention of interstrata movement: Rule 10.	Installation of casings and cement.	Use of stronger alloys for casings to inhibit corrosion or rupture; use of inert, resistant liners in casing; use of electric logs to more closely delineate freshwater strata to establish casing requirements.

TABLE 10-1

MITIGATING MEASURES RELEVANT TO OIL AND GAS DEVELOPMENT IN COASTAL ALABAMA AND MISSISSIPPI

CATEGORY	REGULATORY REQUIREMENTS	INDUSTRY PRACTICES	OTHER POTENTIAL MITIGATION MEASURES
WATER QUALITY	Surveys prior to construction activities. 404(b) permitting process for all types of dredge fill activities with possible expansion. Zero discharge rules. Preferred methods to obtain site access. Preferred spoil management techniques. Periodic monitoring of industry practices. Recommend or require particular dredging and pipe-laying techniques. Site restoration requirements. Avoid certain activities at certain times of the year. Supervise canal dredging and other dredging activities. Require "buffer zone" between dredging activity and environmentally sensitive area. Intensify enforcement of permit requirements. *Designate certain area(s) as parks or wildlife refuge(s).*	Spoil bank development with environmental considerations. Siltation curtains. Coordination with Fish and Wildlife Service field scientists.	Prohibit hydrocarbon-related surface activities at particular locations, based on future research. More extensive use of site monitoring. Innovative surface water runoff control. Utilization of new dredging methods including spoil release and seasonality. Investigate the possibility that dredged material banks with no gaps may be prefered. Minimize wetland disturbance, particularly from October through March. Use of trestle roads to gain site access.
AQUATIC ECOSYSTEMS	Environmental review of permit applications by federal and state agencies and the public. No pollutant discharge requirement. Spill contingency plans.	*Use of floating oil spill booms across canals at all times in the Delta.* Use of sheet pile around 3 sides of drilling barges in Mobile Bay or Mississippi Sound to reduce area affected, help contain small spills and reduce pad scour. Directional drilling to reduce drilling sites needed.	In the Mobile Delta, reduce or eliminate turbidity by using boring methods for channel crossings, silt curtains when dredging, and directional drilling or other drilling alternatives to reduce dredging requirements. In Mobile Bay, *Mississippi Sound and the Gulf of* Mexico allow no dredging for well site access; establish buffer zones around seagrass beds and oyster reefs in Alabama waters; plan pipeline routes to avoid areas of particular value such as seagrasses and oyster reefs; replant seagrasses or restablish oyster reefs if disturbed; utilize joint ventures and trunklining to reduce number of pipelines required. Station spill response equipment in the region; store more spill containment equipment at each well location. Acquisition of lands for preservation.

American Petroleum Institute (API), such as the API Recommended Practices for Safe Drilling of Wells containing Hydrogen Sulfide and API Specification for Materials and Testing of Well Cements.

OTHER POTENTIAL MITIGATING PRACTICES

4.4 There are many other mitigating practices and measures that could be utilized to reduce or eliminate environmental effects resulting from oil or gas resource development activvities. Mention of a mitigating measure in the following table does not mean that all or any of the listed items would be necessary, required, or feasible under all situations.

CHAPTER 4

MITIGATING MEASURES

INTRODUCTION

4.1 The postulated levels of hydrocarbon development in coastal Alabama and Mississippi would have a variety of environmental effects as detailed in Chapters 4 through 8 of the GEIS. In the case of many of the undesirable effects, the degree or severity depends in large measure on what concurrent actions are taken to minimize or offset the adverse effects. A variety of possible mitigating measures are available for the different phases of hydrocarbon development. These are given in Chapter 10 of the GEIS. Table 10-1 at the end of this chapter lists the various mitigating measures under the three broad categories:

- o Regulatory requirements
- o Industry practice
- o Other potential mitigation practices

Under these categories, mitigating measures are listed for the various subcategories of the physical, biological or socioeconomic environment that would be potentially affected by development activities.

REGULATORY REQUIREMENTS

4.2 This category includes those measures required by federal, state and local laws and regulations pertaining to hydrocarbon development specifically or to related activities in a particular environment. For example, the state oil and gas boards have specific bore hole casing requirements to protect groundwater resources.

INDUSTRY PRACTICE

4.3 In this category are various practices which the oil and gas industry generally follow in the various phases of development of oil and gas resources. For example, companies employ a variety of practices and equipment to maintain safe operating conditions when drilling into formations with high hydrogen sulfide concentrations. One set of industry practices are not summarized in this chapter but are included in the bibliography. These are the various Recommended Practices and the Specifications published by the

TABLE 2-21 (Concluded)

SUMMARY OF ENVIRONMENTAL EFFECTS OF ACTIVITIES ANALYZED ON A REGION-WIDE BASIS FOR THE RESOURCE DEVELOPMENT SCENARIOS

PARAMATER	EFFECT
Socioeconomic Characteristics	At a maximum as many as 24,000 laborers could be needed in year 8 for all simultaneous activities occurring in the Mobile Delta, Bay, Eastern Sound, Alabama Gulf waters and the adjacent Federal OCS. Excluding the Federal OCS, about 7,000 workers could be needed; only 3,000 positions would have the opportunity for local participation. The remainder would be associated with activities offering little, if any possibility for local involvement. Only in the highly unlikely case under the high scenario, where all employment needs are required from populations in Mobile and Jackson Counties and the surrourding community radius would immigration be likely. The EIAM indicates that in years 7 and 8 some immigration could occur. Under a more likely case under the high scenario, however, no in-migration is likely to result. Land use needs for projected hydrocarbon activity could be accommodated. Revenues from severance taxes and royalties could boost area coffers, particularly in Alabama, where revenues of as much as $20 billion over the next 30 years could be collected.

CHAPTER 13

INTERAGENCY PERSPECTIVE AND RECOMMENDATIONS

INTRODUCTION

13.1 The objectives of the preceding chapters of this generic environmental impact statement (GEIS) were to:

- Define a given study area and describe the physical, ecological, social, and economic conditions of the area in quantitative and, when data were unavailable, qualitative terms.
- Estimate the potential hydrocarbon resources of the study area to the extent possible based on existing data.
- Identify and evaluate the reasonable unit actions available to industry to explore for and produce hydrocarbon resources.
- Develop reasonable scenarios of the most likely range of hydrocarbon activities that might occur during the next 30 years.
- Evaluate and display the environmental impacts to the given study area based on the scenarios.

13.2 During the scoping process of this GEIS it became evident that some general assumptions were needed to manage the alternatives that could be subject to evaluation. These assumptions were established at the beginning of the GEIS process and continued throughout. The adoption of these assumptions does not preclude future evaluation of activities that would violate the assumptions; rather, it means that the singular and accumulative impacts and subsequent conclusions and recommendations could be invalid and a separate environmental evaluation, based on the revised assumption, would be required prior to decision on a permit application containing an exception to the assumptions in this GEIS.

13.3 The major environmental impact limiting assumptions for this GEIS are:

- No discharge of cuttings, drilling fluids, formation waters, contaminated wastewaters or contaminated rainwater runoff into area waters.

- All pipeline trenches will be backfilled.
- All canals and slips for use of an inland drilling barge will be restored to pre-project contours upon abandonment.
- All access channels will be backfilled upon abandonment.
- All regulations will be followed.
- Scenarios are based on minimizing the number of surface structures (multiple drilling from platforms to maximum extent), and some joint ventures will be used for pipelines.

13.4 An important purpose of this GEIS is to expedite the permitting process for hydrocarbon activities within the given study area while protecting natural and man-made resources. As a guide for the permitting process, an interagency perspective and subsequent recommendations, drawn from the preceding chapters, are presented in this chapter.

PERSPECTIVE

Potentially Significant Impacts

13.5 Based upon the analysis of the impacts associated with the various activities involved in the exploration, development and production of hydrocarbons in the study area, the following potentially significant adverse impacts for the entire study area have been identified. Any activity associated with hydrocarbon operations that results in an impact upon the following environmental or socioeconomic factors is considered potentially significant.

a. Loss of natural resources.

   1. Wetlands.
   2. Submerged aquatic grassbeds or macroscopic algal communities.
   3. Normally living oyster reefs and other live bottoms.
   4. Exposed hard bottoms.

5. Bird rookeries and populations.

b. Restriction of fishing activities.

1. Trawling and seining.

c. Degradation of air quality.

1. Exceed allowable air quality degradation increment near urban/industrial areas.

2. Exceed short-term ambient air quality standards near gas processing facilities.

3. Hydrogen sulfide or other toxic gas release for more than a short time.

d. Degradation of groundwater quality.

1. Pollution of aquifers due to leaching of pollutants from unlined ponds or lagoons.

2. Accidental contamination of potable aquifers via the well bore including disposal wells.

e. Degradation of viewshed.

1. Location of platforms and rigs which can be readily seen from high use beaches.

f. Accidents.

1. The loss of well control or pipeline failure that would result in the release of oil, H_2S or other type gas to the environment is identified as being of great concern due to the potential adverse impacts that such an accident would have upon living resources, water quality, human life, health, and property.

Minor Impacts and Concerns

13.6 Although the following items were not demonstrated in the GEIS to qualify as potentially significant impacts, they are items of concern or items that could result in minor impacts and should be considered as permit applications are being evaluated and the hydrocarbon industry is developing in the study area. Included in this minor impacts category are:

1. Increased turbidity from various oil and gas activities.

2. Air emissions from flares, crew boats, generators (burning refuse in delta, marsh situation).

3. Inadvertent impacts to cultural resources and endangered species habitat.

4. Alterations in surface drainage patterns and circulation which could result in modifications in sediment transport.

5. Competition between hydrocarbon interests, and commercial and recreational waterway and facility users.

6. Increased demand on berthing and service facilities for support vessels.

7. Local impacts associated with construction of new support facilities.

8. Local impacts to secondary road system due to increased vehicular traffic for land-based or land-accessed rigs and construction activities (concrete trucks, 18-wheelers, sand blasting carriers, etc.).

9. Local impacts due to increased demand on public facilities such as sewage treatment plants, potable water systems, fire protection, waste disposal operations, etc.

10. Changes in salinity regimes in the Mobile Delta due to trenching, channelization and circulation restrictions such as dikes, levees, and roadways.

11. River and canal bank erosion due to damaging wakes from crew boats servicing rigs.

12. Public perception of potential public health hazards due to transportation and disposal of drilling wastes in upland sites.

13. Disturbances to bottom communities during transportation and emplacement/displacement of submersible rigs.

14. Disturbances to sensitive wetlands during pipeline construction, roadway construction, and other activities under the provisions of the Nationwide permit or outside the jurisdiction authority of the regulatory agencies, yet close enough to sensitive jurisdictional area to create synergistic impacts.

RECOMMENDATIONS

Permits

13.6a The Generic EIS serves as support information for the Mobile District Corps of Engineers regulatory program. There are two categories of permitting under this program including general and individual permits. As specified in the rules of the Corps of Engineers regulatory program published in the Federal Register July 22 1982, there are two types of general permits referred to as nationwide and regional permits.

13.6b A nationwide permit is a form of general permit which authorizes a catagory of activities throughout the nation. Nationwide permits are designed to allow work to occur with little, if any, delay or paperwork. However, the nationwide permits are valid only if the conditions applicable to the nationwide permit are met. There currently exists nationwide permits for discharge of dredged or fill materials in certain waters of the United States and certain specific activities. The permit listings are too lengthy to present herein but are contained in the July 22 1982 rules.

13.6c A regional permit is a form of a general permit also designed to reduce paperwork and processing time. Based upon appropriate environmental evaluations, regional permits may be issued by the District Engineer for specified activities and areas.

13.6d If a proposed activity is not covered by a nationwide or regional general permit, it is not precluded but rather must be processed under an individual permit application This type of permit action addresses site-specific activities proposed by a particular permit applicant.

13.6e Based upon analysis contained in the Generic EIS, the cooperating agencies have developed recommendations for the permitting program related to hydrocarbon exploration and development in the study area. These recommendations are detailed in the following paragraphs.

13.7 Mobile Delta. Due to the ecological sensitivity of the Mobile Delta and the lack of specific data to support a finding of no significant impacts, it is recommended that no general permit be considered for hydrocarbon activities in the Mobile Delta at this time, other than the nationwide general permit currently in effect. All other activities would continue to be processed under individual permit applications. Further studies are recommended for the Delta.

13.8 Mobile Bay, Mississippi Sound and Gulf Coastal Waters. An evaluation of data contained in this GEIS coupled with experience gained from drilling operations in the Mobile Bay and adjacent waters support the recommendation for a general permit to include specific activities in selected portions of the study area. Recommended elements of this general permit are as follows:

PROPOSED GENERAL PERMIT
FOR HYDROCARBON EXPLORATORY/APPRAISAL DRILLING ACTIVITIES
IN MOBILE BAY/MISSISSIPPI SOUND AND
ALABAMA/MISSISSIPPI OFFSHORE WATERS

Hydrocarbon exploratory and appraisal drilling activities may be conducted on the above referenced areas provided the following conditions are met.

Condition Number 1: All Applicable State and Federal Regulatory requirements are met.

Condition Number 2: No discharge of drilling muds, cuttings, fluids, production (formation) waters, contaminated deck drainage, or sanitary wastes.

Condition Number 3: No dredging associated with the activity except that necessary for drilling pad site preparation. The limits of dredging shall not exceed 3,500 cubic yards from an area of 75 feet by 250 feet and the dredged material shall be transported to an approved designated disposal site. Only clean oyster shell, clam shell, or coarse aggregrate may be used for the drilling pad.

Condition Number 4:

A. In Alabama, the drilling site must be beyond one mile from shorelines fronting the Gulf of Mexico and one-half mile from other shorelines.

B. In Mississippi, the drilling site must be beyond one mile from any shoreline.

C. In Alabama and Mississippi, the drilling site must be beyond one mile from producing oyster reefs as defined or specified by the affected State and one-fourth mile from any known community of submerged aquatic vegetation. For verifications see Condition Number 8.

Condition Number 5: Submittal of a project-specific State approved oil spill contingency plan and blowout prevention plan.

Condition Number 6: Provide adequate navigation markings required by the affected State and United States Coast Guard.

Condition Number 7: No drilling rig will be located within established safety fairways and a 500-foot buffer zone will be provided on either side of other Federally maintained navigation channels and a 500-foot buffer zone provide on either side of pipelines. (Note: All structures and anchors must be placed in compliance with 33 CFR 209.135, July 1, 1983).

Condition Number 8: Survey Requirements. Before an action can be considered as qualifying under the provisions of this General Permit, the applicant must complete environmental and cultural resources surveys and submit the surveys with the application for authorization under this General Permit to the District Engineer.

Environmental Survey Requirements Applicable to Mississippi Resources

As a necessary corollary to Condition Number 4, an environmental survey shall be conducted in Mississippi to determine if, at the community level, submerged seagrass beds and attached macro- scopic algae are within 1,300 feet of the perimeter of the area to be disturbed. This survey shall be required only in the following areas.

1. Passes between the barrier islands with the survey area extending 2 miles north of a line representing the shortest distance between adjacent islands.

(See the attached map which shows the southern boundary limit for required environmental survey work in passes east of the Gulfport Ship Channel.)

2. A zone within 2 miles of the shoreline of Cat Island (a barrier island).

3. A zone within 2 miles of only the northern shoreline of the other barrier islands (Ship, Horn and Petit Bois).

4. A zone within 1.5 miles of the shoreline of Round Island.

5. A zone extending 2 miles south from the opening to the Point Aux Chenes Bay.

In Mississippi, also an environmental survey shall be conducted to determine if hard bottoms or oyster reefs are within 300 feet of the perimeter of any area to be disturbed. However, neither the 300 ft. nor the 1,300 ft. environmental survey will be required in the state's territorial waters of the open Gulf which are located east of the Gulfport Ship Channel. These particular waters are located south of the barrier islands.

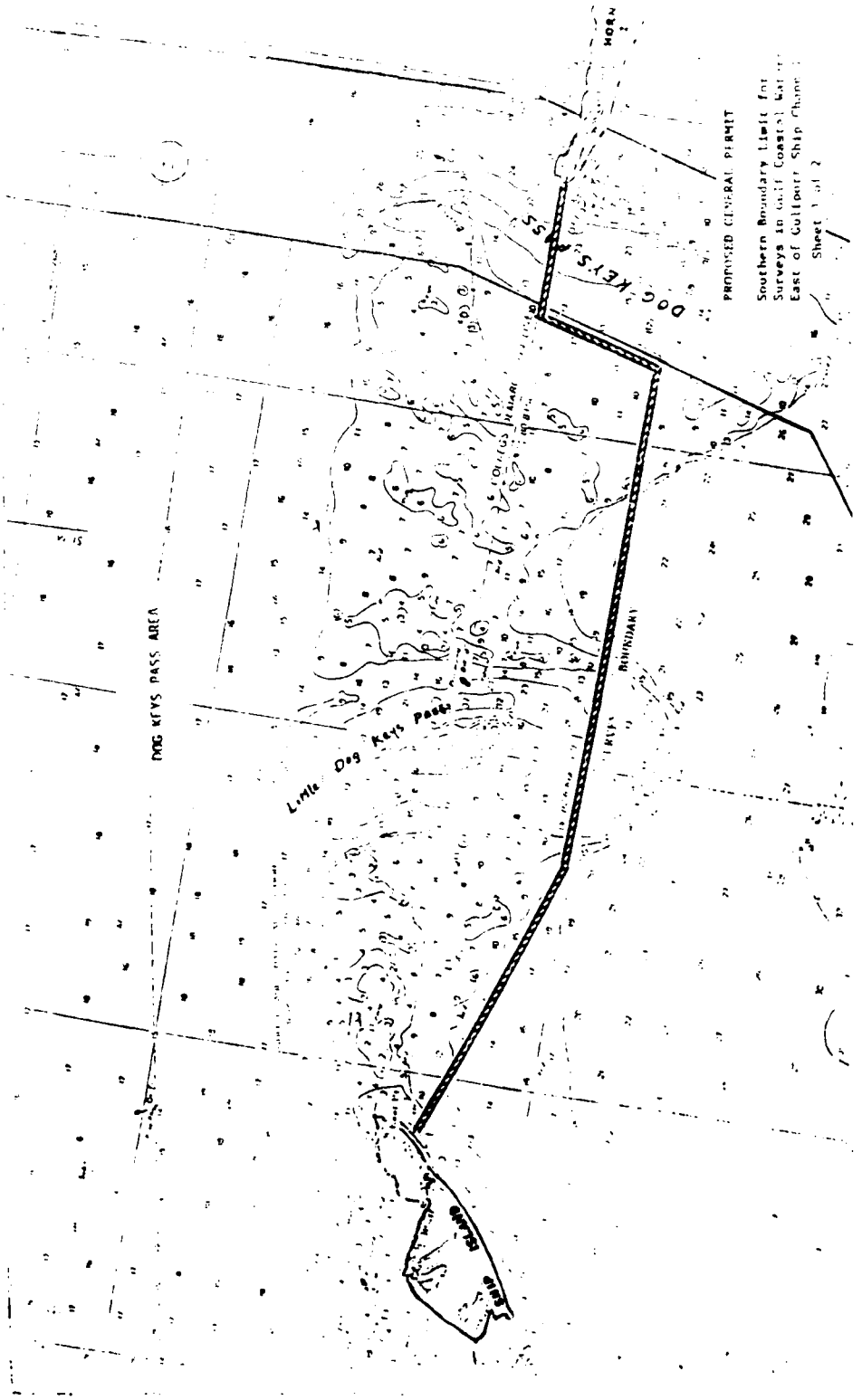
Environmental Survey Requirements Applicable to Alabama Resources

This environmental survey shall include the identification and location of oyster reefs, hard bottoms, submerged seagrass beds and attached macroscopic algal communities within a 300-foot radius of the area to be disturbed. No environmental survey would be required in the State's Gulf coastal waters.

Cultural Resources Survey Applicable to Alabama and Mississippi

For cultural resources consideration, the survey shall be in accordance with the Mobile District, Corps of Engineers requirements.

Condition Number 9: The application for authorization under this General Permit, along with the required environmental or cultural resource surveys, will be subject to a ten-day agency review. The U.S. Army Corps of Engineers will consider agency comments in the permit decision.


PROPOSED GENERAL PERMIT
Southern Boundary Limit for
Surveys in Gulf Coastal Waters
East of Gulfport Ship Channel
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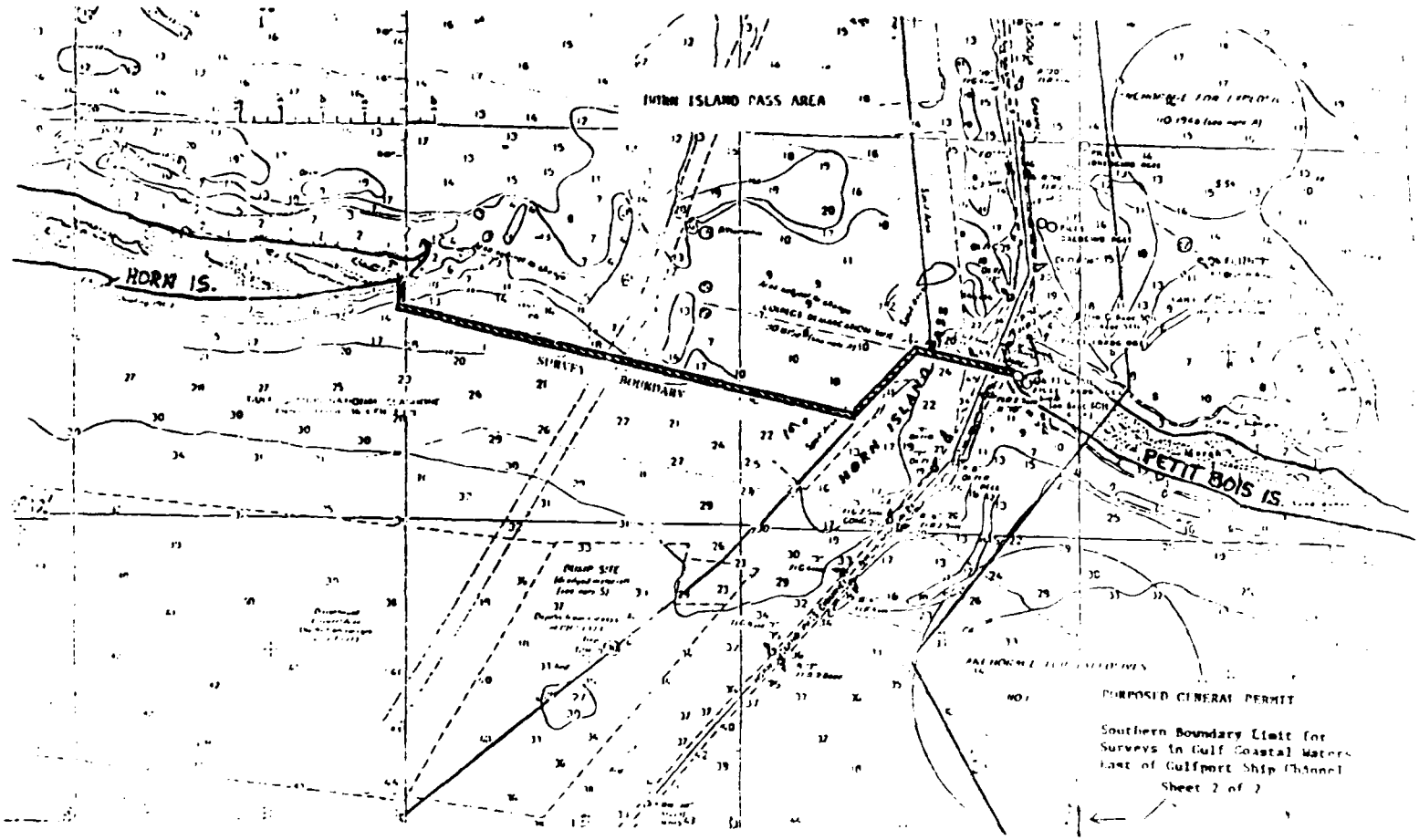
DOG KEYS PASS AREA
Little Dog Keys Pass
DOG KEYS


HORN ISLAND PASS AREA
HORN IS.
SURVEY BOUNDARY
HORN ISLAND
PETIT BOIS IS.
PROPOSED GENERAL PERMIT
Southern Boundary Limit for
Surveys in Gulf Coastal Waters
East of Gulfport Ship Channel
Sheet 2 of 2

13.8a Although sufficient information is presented in the GEIS to support further recommendations for a regional general permit, the GEIS provides an environmental analysis for the evaluation of specific permit actions and will facilitate applications for the study area. This information provided by the GEIS should contribute to an efficient processing of individual permit applications for activities and areas covered by existing nationwide or recommended regional general permits.

Environmentally Preferred Alternatives

13.9 The GEIS discusses mitigation to lessen impacts from various alternative unit actions and scenarios. While recognizing that these alternatives exist, this section supplements those discussions by identifying least-damaging options recommended to industry.

3.10 The following environmentally preferred alternatives have been developed to encompass consideration of potentially significant impacts and activities preferred to be avoided. These alternatives would minimize to the extent practicable adverse environmental impacts. Although these conceptual alternatives may not be feasible in all cases for the geographic zones of reference, they serve as a focal point and basis of encouragement to industry in developing the most environmentally acceptable plans. These environmentally preferred alternatives for each geographic area are presented here.

13.11 Delta. Environmentally preferred techniques to minimize wetland and riverine disturbances are suggested as, but not limited, to:

1. a. Directional (slant) drilling not requiring any dredging in wetlands or minimized safety risks by location of drilling rig at a river bank slip.

   b. Drill site access by air with minimal clearing of trees in immediate area of drill site.

   c. Trestle road and portable land rig with operations base upland; or with an operations base on barges moored at a river location not requiring any wetland dredging.

   d. Use of board road on natural grade without fill material placed in wetland.

   e. Employ horizontal boring for pipeline installations through wetlands and through riverine environment.

f. Sufficient alert and leak detection equipment on pipelines for drilling fluids, muds, liquid wastes and hydrocarbon products for duration of activities.

g. Crew boat trips minimized and under reduced speed and wake operation to minimize bank erosion.

2. Rigs not located near bird rookeries to minimize noise disturbance.

3. Applicant participation in a rapid deployment spills response team on continuous call from a local operations base stockpiled with state-of-the-art spill containment equipment and clean-up materials to handle a major accident.

4. Restricted public access within one half mile of facilities to minimize danger from H_2S accidents.

5. A waste management plan designed for secure handling of sludges, wastewaters and solid wastes during maximum flooding conditions. Plan should include tank containment of sludges and wastewaters on the rig platform and frequent conveyance to upland or to a waste barge moored at a river site via temporary above-grade pipeline.

6. Testing of waste residuals (sludges) generated from drilling mud reprocessors/disposers for RCRA category.

13.12 Bay/Sound and Alabama/Mississippi Offshore Waters. The Recommended General Permit Criteria identified in this EIS constitute the preferred alternatives. In addition, the following elements would be included.

1. Employment of shallow draft rig and barge equipment to avoid dredging.

2. Use of directional drilling, trestle road or air transport to access drill sites in marsh.

3. Avoid pipeline landfalls where marsh or aquatic grassbeds are present.

4. Horizontal boring to install pipelines under sensitive areas.

5. Sufficient dirt and leak detection equipment on all pipelines and rigs and production facilities.

6. Minimize bay bottom trenching by joint ventured pipelines and installing multiple pipelines in single corridor.

7. Participation in a local rapid deployment spill response team on continuous call and fully operational.

8. Prompt refilling of pipeline trenches through water bottom.

9. Avoid gas treatment plant or rig sitings near urban/ industrial or Class I air quality areas.

10. Testing of waste residuals (sludges) generated from drilling mud reprocessors/disposers for RCRA category.

Surveillance and Progressive Assessment

13.13 Increased hydrocarbon activities as a result of general and nationwide permitting in sensitive wetland and aquatic ecosystems of coastal Alabama and Mississippi pose the potential for some of the significant adverse effects which have been identified in the EIS. Also, other underlying potential impacts remain which have not been delineated as significant but are of general concern.

13.14 Federal, State, and local authorities directly involved in regulating the hydrocarbon industry should consider the anticipated scope of hydrocarbon activities and the identified cumulative impacts which may result. This consideration could be accomplished by progressive assessments and consistent surveillance. Benefits derived would include:

a. An ongoing identification of actual impacts.

b. Improved permit compliance monitoring.

c. Opportunity to evaluate the construction and operations of ongoing hydrocarbon activities.

d. Provide background to encourage industry to seek innovative technology.

APPENDIX A

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